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THE PROCEEDINGS OF A SHORT COURSE ON THE TECHNICAL AND PLANNING ASPECTS OF SOLID WASTES HELD AT COLUMBUS, OHIO ON SEPTEMBER 20-24, 1965

OHIO DEPARTMENT OF HEALTH, COLUMBUS

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David H. Armstrong

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TECHNICAL AND PLANNING ASPECTS OF SOLID WASTES. . . . .

sponsored by
Ohio Department of Health
U. S. Public Health Service

Columbus, Ohio

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The proper storage, collection, and disposal of solid wastes is a major problem due to increased urbanization and the steady increase in per capita production of solid wastes. The Ohio Department of Health at the request of the Public Health Service presented a course covering all aspects of the problem, including planning. This document contains the proceedings of that course. Nationally recognized authorities in the field of solid wastes and planning presented problems and solutions to a group of trainees representing many disciplines and many sections of the country.

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TECHNICAL AND PLANNING ASPECTS OF SOLID WASTES

Columbus, Ohio - September 20-24, 1965

sponsored by

Ohio Department of Health
U.S. Public Health Service

in cooperation with

American Society of Mechanical Engineers
American Society of Civil Engineers
American Institute of Planners
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PREFACE

The proper storage, collection and disposal of solid wastes has long been considered a major problem by public health authorities and those directly concerned with the conduct of this program. More recently, because of increased urbanization and the steady increase in per capita production of solid wastes the problem has become, in the minds of many, one of primary significance in the field of environmental health.

In order to stimulate more interest in the problems of solid wastes storage, collection and disposal and to present avenues of approach and solutions to many of the facets of the problem, it was felt that a short course covering all aspects of the problem, including planning, should be developed and presented to the many disciplines directly and indirectly concerned. In addition to public health personnel, these would include consulting engineers, planners, educators and public officials, not to mention civic groups.

The Public Health Service prevailed upon the Ohio Department of Health to undertake the preparation and presentation of such a course. With the help of a Public Health Service grant, nationally recognized authorities in the field of solid wastes and planning were obtained to present problems and solutions to a group of trainees representing many disciplines and many sections of the country.

The proceedings of that course are contained herein and it is hoped that those who have access to this publication will see fit to use the valuable material contained herein.

C. M. Robinson
Ohio Department of Health
Course Director

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COURSE OBJECTIVES

The short course on the Technical and Planning Aspects of Solid Wastes was convened promptly at 9:30 A.M., Monday, September 20, 1965, at the Nationwide Inn, Columbus, Ohio, by C. M. Robinson, Engineer-in-Charge, General Engineering Unit, Division of Engineering, Ohio Department of Health. Mr. Robinson, who is Training Program Director for the short course, introduced himself and called on each of the trainees, who were seated alphabetically, to stand, give his name, position title, and where he was from.

Mr. Robinson then introduced Mr. George H. Eagle, Chief of the Bureau of Environmental Health, Ohio Department of Health, who welcomed those present on behalf of Dr. Emmett W. Arnold, Director of Health, who was regrettably unable to be present.

Mr. Eagle then, as Chief Engineer, Ohio Department of Health, outlined the Course Objectives as follows:

Trainees, participants and guests, I wish to welcome you to this, the first short course on Technical and Planning Aspects of Solid Wastes. I say the first short course because, to the best of my knowledge, this is the first time a course of this type has ever been given anywhere in the United States. We are honored and grateful that Ohio was selected for this short course. It is a lot of work to arrange and carry out the program you will be having this week. But we do not mind this _if_ the results justify the means and I am sure they will. I wish to give credit to my staff, and to the many people in the Public Health Service and other fine organizations who are cooperating in this program, for the time and effort they spent in arranging this course.

To me, the handling and disposal of solid wastes, particularly the disposal, is the most neglected area in the entire environmental engineering field. We are, in many respects, about 50 years behind the times. Just now, here in Ohio, we are getting started on the first county-wide refuse disposal facilities. Montgomery County, I understand, has finally been given the green light by the courts to proceed with the construction of two incinerators, one in the north part of the county, and one in the south part, to serve the entire county. A number of places in Ohio are attempting to set up similar programs, and high time it is that they are finally getting on the ball. Every metropolitan area in the state, and we have 20 of them here in Ohio with over 100,000 population, should have such facilities. No longer can each suburb and each allotment handle this problem by themselves.

The magnitude of this problem will be discussed by the next speaker. There has been tremendous interest on the part of some who applied to attend this course from such faraway places as Alaska and the Virgin Islands.

As a body of trainees, you represent those whom we hope to motivate to represent the problem, plan for its solution and effect implementation of the plan by working with those persons with authority to do something.

You are a unique group in that you are composed of the many disciplines directly concerned with the problem. Included in your group are planners, consulting engineers, governmental officials, educators and public health officials from state and local levels from several states.

Those responsible for the preparation of the agenda have not only developed a well rounded program but have been successful in obtaining for the instructional staff nationally and internationally recognized authorities in their fields.

It is my sincere hope that all of you will actively participate in the discussions which you can make interesting and informative. We plan to make a permanent record of the proceedings of this course and each of you will receive a copy in due time. It is hoped that these proceedings will provide each of you with authoritative reference material.

Best of good wishes for a successful, interesting and pleasant week here in Columbus, Ohio.

DEFINITION OF THE SOLID WASTES PROBLEM

By: Norman E. Tucker, Chief
Urban Environmental Health
Planning Training, Training Program
Public Health Service
Department of Health, Education, and Welfare
Cincinnati, Ohio

Someone once said that New York's Tammany Hall was "the house that apathy built." We might very well use this same analogy and rephrase it to be, "Our refuse problems today are the dumps that apathy have created". . . apathetic citizens . . . apathetic politicians . . . apathetic planners . . . apathetic health personnel. And, if we were to sum up the "Definition of the Solid Wastes Problems" into one simple cause, it could be this APATHY.

What has caused this attitude?

Why does it persist?

How can we overcome it?

These and dozens of other questions concerning the ever-mounting garbage and refuse pile (amounting to 150,000,000 tons per year) can no longer continue to go unanswered . . . can no longer be swept under the government carpet . . . can no longer continue to create an odoriferous, smoking, seeping, crawling, unhealthful fringe area dump, oftentimes existing under the guise of a "sanitary landfill" when the only thing "sanitary" about these dumps are the misnomers given to them.

Community Education -

Sanitary Landfills versus Open Dumps . . . this misunderstanding by the community, its leaders and the appropriate agencies of what is called a "Sanitary Landfill" and what is the old-fashioned "open dump" is the first of the basic problems we must define.

The fact that a true sanitary landfill properly operated, can be coexistent with the normal community environment, is long over-due as a prime objective of a community educational awareness program. The fact that the ingress and egress to such areas can be "accepted" by the continguous neighborhood if properly covered, compaction-type trucks are employed, is another vital awareness problem.

Political Unsavoriness -

It is the American heritage that we enjoy the free political system. But, so long as the responsibility of solid wastes lies within this political pervue, we shall experience the tendency to "duck" an unsavory issue if it means a loss of votes to this elected official. Who can deny this truism? Who can deny that the location of any disposal facility escapes this "sweeping-under-the-rug" attitude in most political arenas?

Planning Proficiencies -

A study of the various curricula of planning departments in our universities reveals a severe dearth of theory, practical exercises, and application of principles for the collection and disposal of solid wastes. Even a greater scarcity for information on master refuse planning. How, then, can we expect our representatives of the planning profession to enthusiastically approach a problem about which they are ill-trained? For which they have a few funds to support such effort? And for a problem their own employers (the politicians) refuse to take positive attitude?

Health Department Complacency -

Even the appropriate health departments exhibit a certain obliviousness to the mounting problem in their domains. This may be from a number of causes; namely,

1. Inadequate legislation to effectively attack the problem.

2. Inadequate staff to cope with the problem.

3. Lack of training in proper methods and operations.

4. Fear of becoming involved in local "hot potatoes."

Lack of Research and Training -

The one by-product of man's existence, viz, his solid wastes, has apparently received the least attention as to the research into new and improved means and methods of elimination. The associate training in the utilization of this undeveloped research lies dormant pending the need for its ovulation.

Economical and Physical Considerations -

Much has been written about the diminishing amounts of available land for disposal sites, whether for dumps, landfills, incinerators, composting plants, or other means. It is apparent that the volume is on the increase, primarily from two sources: increased population and increased amounts per capita per day. Costs in all aspects are rising because of several reasons:

1. Equipment costs
2. Maintenance costs
3. Labor costs
4. Land procurement costs
5. Inflationary trends
6. Diminishing tax funds
7. Reluctance to increase charges
8. Municipal bondability limitations

SOLUTIONS

It is easy to identify problem areas-the solutions come with much more painful exertion. A cursory look would indicate, however, that in the case of solid wastes, each of the problems have a rather obvious "solution" to wit:

A. Increased Community Education.

B. Change of political attitude or the removal of solid wastes control to a nonpolitical entity.

C. Augmentation of planning curricula to include solid wastes and/or specialized training for practicing planners.

D. Provision of a stimulant for health departments concurrent with adequate legislation, staffing, training, and release from political stigma.

E. Increased research and training in resulting developments.

F. The realization that the Solid Wastes Problems should be economically treated as a utility service to the consumer with the necessary payment to operate it. It is not inconceivable that such a "Solid Waste Utility" could not produce adequate funds to effectively overcome all the other problems previously identified.

REFUSE QUANTITIES AND COMPOSITION

By: Casimir A. Rogus
Director of Engineering
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New York City

SOLID WASTES - DEFINITION

The discarded substances of a normal community may be gaseous, liquid or solid. The term commonly applied to solid wastes is REFUSE. Its generally accepted short definition reads, "All of the solid wastes of a community inclusing those semi-liquid or wet wastes whose moisture content is insufficient to make the material free flowing." Refuse may be sub-classified for purposes of more specific definition, and engineering and legal understandings into Garbage, Rubbish, Ashes, and Special Wastes. These can be defined thusly:

Garbage -- putrescible wastes derived from the preparation, cooking and serving of foods; from their handling, storage and sale in produce markets; from their handling, processing and storage in abattoirs, canneries and quick-freeze industries.

Rubbish -- non-putrescible wastes of a combustible and/or non-combustible character normally produced by the community. Typical combustibles are paper, wood and cloth products; rubber, leather and synthetics; garden wastes. Typical non-combustibles are metals, metallic and plastic products, stones and dirt, masonry, ceramic and glass products.

Ashes ---- residue, including cinders and fly ash, from burning solid fuels for cooking and heating, and from on-site incineration of refuse materials.

Special Wastes --

a) Street Refuse - sweepings, litter, leaves and dirt.

b) Demolition and Construction - lumber, masonry, plaster, piping, conduits, roofing and insulation, excavated dirt and stone.

c) Dead Animals - cats, dogs, rodents, birds, fish, cattle, horses, and zoo specimens.

d) Out-sized Wastes - abandoned vehicles, stoves and refrigerators, over-large furniture, tree trunks and stumps, driftwood, palm fronds.

e) Sewage Treatment Works - screenings, grease and scum, grit.

f) Anatomical and Pathological wastes from hospitals, clinics and medical centers.

g) Industrial (usually self-disposed). These are almost limitless. They range from the quite common cinders and fly ash from power plants to highly specialized wastes of specific industries. They include various hazardous chemicals and chemical by-products, paints, explosives and radio-active wastes.

h) Miscellany - Christmas trees, rubber tires, various plastic materials, cemetery floral pieces.

In addition to the above communal refuse are the AGRICULTURAL and CANNING wastes. Both of these, although produced in this country in very large amounts and of considerable concern nationally, are generally not municipal problems and hence will not be discussed here.

Refuse may also be classified by its origin, to wit: Domestic, Municipal, Commercial, and Industrial. These may be defined as follows:

Domestic Refuse - includes all those types which normally originate in the residential household or apartment house.

Municipal Refuse - embraces all the types which originate on municipally owned property. These include street sweepings and litter, catch-basin dirt, refuse from parks, playgrounds, zoos, schools and other institutional buildings; solid wastes from sewerage systems.

Commercial Refuse - includes all solid wastes which originate in businesses operated for profit such as office buildings, stores, markets, theatres and privately owned clinics, hospitals and other institutional buildings.

Industrial Refuse - includes all solid wastes which result from industrial processes and manufacturing operations such as factories, processing plants, repair and cleaning establishments, refineries and rendering plants.

HANDLING SYSTEMS

The responsibility for the collection and disposal of these several types of wastes has not been uniformly established. Practice varies with each municipality and is dictated by local policy which, at times, changes with the city's administrations, the city charter or change in the city's financial solvency. A general pattern however does seem to exist. The collection and disposal of Domestic and Municipal wastes is normally handled by city forces and facilities. Commercial refuse is most frequently collected by private contractors but to the municipality's rules and regulations. Its disposal is sometimes made in the contractor's private facilities, but more often in municipally owned facilities on payment of established fees. Industrial refuse is almost invariably the responsibility of the Company itself. They design and operate their own collection and disposal systems but under some controls and regulations legally imposed by a pertinent government agency.

FACTORS INFLUENCING QUANTITIES AND COMPOSITION OF REFUSE

At this point it is proper to define "Quantity" and "Composition" as used herein. By "Quantity" is meant the amount of solid wastes produced. Although in the past and to a substantial degree even today quantities are reported by volume - usually cubic yards - it is almost self-evident that reporting by weight - in lbs. or tons - is the more accurate method. The arguments are:

1) The density of refuse can vary from 100 to 1,500 lbs. per cu. yd. depending on its contents.

2) Refuse of identical composition can vary greatly in unit weight depending on amount of external moisture from rain, snow, or quenching waters.

3) The degree of compaction used in the collection process can double or triple the initial density.

Similarly, the basic units now used interchangeably to report amount of refuse produced or put out are lbs. per capita per day and tons per capita per year. Since the amount produced varies seasonally and since it is generated every day of the week (although collection and disposal operations usually operate only five or six days per week) it is suggested that:

1) For purposes of designing collection and disposal systems quantities should be reported in lbs. per capita per calendar day with subsequent appropriate adjustments in designing

the disposal plant elements to lbs. per capita per working day.

2) In comparing the total unit output among or between communities the quantities should be reported in tons per capita per calendar year.

The term "Composition" as used herein will be used in three distinctly different categories, to wit:

1) Major component materials - garbage, paper, textiles, wood, metals, ceramics, plastics, ashes, dust, garden wastes.

2) Physical properties - density, moisture content, calorific value, size, and sieve analysis (passing 1/4 inch openings).

3) Chemical composition - carbons, hydrogen, nitrates, phosphates, etc.

The discussion that follows concerns itself with all solid wastes (Domestic, Municipal, Commercial, Industrial) regardless of their origin and irrespective of the methods used for their collection and/or disposal. The factors which affect the characteristics and their total output for municipal handling are:

1) Number and types of industries and degree to which their wastes are self-disposed.

2) Number and types of commercial establishments and degree to which their wastes are self-disposed.

3) Climate. To illustrate - in the warm belt the output of ashes will be negligible whereas the amounts of garden trash may be abnormally high.

4) Seasons. The winter and holiday months will probably produce higher amounts of textiles and wrappings but less of fresh vegetable and fruit wastes.

5) Income level - residential areas in the higher income brackets acquire and waste more per capita.

6) Population density - the high density apartment house areas will generally put out all the wastes they produce (unless they are equipped with on site incinerators) while the individual home-owner will tend to dispose of some of his wastes. Conversely, the apartment house districts will put out fewer leaves, tree clippings and garden wastes.

7) Technological advances - developments in food processing such as pretrimming of fresh vegetables, quick-freezing of many types of foods, canning of fruit concentrates, etc., have all contributed to reducing the garbage content to about 1/3 of its previous value - all within one generation. The ever increasing use of non-solid fuels has almost eliminated the former high ash amounts. The development of many types of synthetic wrappings and the new systems of pre-packaging of many marketable items have increased the amounts of paper, cartons, many varieties of synthetic tissue to a degree where they have more than made up for the reductions in food wastes and ashes.

8) Degree of self-disposal - on-site incineration and garbage grinding does, where used, have a sizeable effect and influence on the amount and character of wastes.

9) Frequency of collection - where collection schedules are generous the output is untramelled. Skimpier schedules tend to restrain the average output.

10) Fees - a charge for collection services, usually in direct proportion to amount of material put out, will invariably reduce the degree of wastage and encourage some self-disposal.

11) Salvaging - an attractive market for such salvables as paper, rags, metals, or bottles will induce many householders or janitors to cull out these materials from the waste put out for collection.

12) Cost and availability of fuels - when the cost of fuels for cooking and/or heating is high or difficult to procure the tendency is to utilize some of the combustible refuse for these purposes either in the cooking range, in the furnace or in the fireplace.

From the above it is obvious that correct values for any given community at any given time can only be obtained by on-site surveys, weighings and laboratory analyses. Nevertheless, for purposes of orientation we will discuss the status of existing information on refuse quantities and characteristics.

QUANTITIES

There is considerable evidence that most of the presently reported amounts are considerably below those actually produced. The unit output figures which have been quoted so frequently in engineering literature ranged from but 2.5 to 2.8 lbs. per capita per day. Little wonder that so many designs were found to be inadequate.

Much of this data was based on information gathered sporadically and usually for short time cycles by individual municipalities to serve their special needs - and all of it without the benefit of standardized sampling procedures or scientific analyses. In the absence of authoritative guides this information lacked uniformity and consistency. Efforts to utilize and to correlate such information can be very frustrating. A study and comparison of the following exhibits is to the point.

Table 1 is taken from "Municipal Refuse Disposal" a 1961 publication of the American Public Works Association. It shows that the per capita output for the twelve cities surveyed ranged from 794 to 1690 lbs. per year with a median of 1430 lbs. per year. Undoubtedly, this wide range was influenced in part by the qualifying factors discussed above, but in part was due, in this writer's judgment, by the absence of uniform standards of sampling and analysis.

Now compare this with Figure 1. This is a bar graph showing the total amount of refuse delivered for disposal in the City of New York within the last four years. It embraces all solid wastes except for a) the self-disposed industrial wastes, b) those wastes going to piggeries and rendering plants, c) those wastes reduced by the apartment house incinerators to ashes, and d) certain non-burnable construction wastes going elsewhere. The sum of these, although substantial, is a small percentage of the total. It will be noticed that the refuse delivered for municipal disposal has been rising progressively from 1200 to 1300 lbs. per capita per year. The spread is small and, in all probability, reflects correctly upward trends. If all solid wastes produced in the City were included and a suitable adjustment was made for the burn-down in apartment house incinerators it can be concluded that the solid waste output, except for the self-disposed by industry, totaled in 1962-63 1600 lbs. per capita per year or about 4.5 lbs. per capita per day.

To check on the above we made a very recent study whose results are reported in Table 4. Please note that this includes all solid wastes common to most communities except for special Industrial Wastes, non-burnable Construction and Demolition wastes, and Automobile bodies. It will be noticed therefrom that the total solid wastes produced amounted to 1632 lbs. per capita per year or 4.47 lbs. per capita per calendar day. On the other hand, the total brought for municipal disposal totaled but 3.44 lbs. per capita per calendar day or 77% of the total refuse produced. Furthermore, because of the known gradual upward trend in refuse production it can be safely predicted that by 1970 these values will increase to 1850 and 5.0, respectively.

It is felt that these reported values are dependable and can be reasonably applied to most urban areas in this country of 100,000 population or more since:

1) The period covered by the above studies was continuous, covering all seasons and extending over five full years.

2) 78% of these quantities were obtained through exact weighings on tamper-proof, electro-mechancial, automatic truck scales at each of the 25 disposal locations (incinerators, transfer stations, and truck landfills). Only the balance was estimated.

3) The total number of weighings - well over 5 million - assures accuracy.

4) The City embraces a complete spectrum of income levels and population densities, and has a representative proportion of residential, commercial and industrial developments.

5) The effect of the existing on-site incinerators, garbage grinders, and other self-disposal methods, although comparatively small, was nevertheless taken into account and their effects on the above quantities were included.

Figure 2 is a graph, again for New York City, showing the monthly and seasonal variations in the total solid wastes delivered for disposal. The fact worth noting is that whereas past published reports (for other municipalities) showed many substantial seasonal variations, those for New York City's total mixed refuse, shows them to be quite mild. The seasonal influences on the separated components might be much more noticeable.

COMPOSITION

Like that on quantities the past published data on characteristics seems to lack consistency and for probably similar reasons. Nevertheless, analyses of even such data indicates considerable changes in the composition and properties of municipal refuse. To illustrate, Table 2 shows the breakdown of New York City refuse of 1939 by its major components for each month of the year. In contrast, Table 3 shows the breakdown of Chicago refuse of 1956-58 to a somewhat different itemization of major components. Comparing the two tables we will note that substantial changes in their garbage, ash, and paper content developed in the intervening 20 years within these two comparable large cities. Thus, Chicago's current content of garbage is but 28% and of ashes but 44% of New York's 1939 vintage. On the other hand the present paper content is over 250% higher. Since both tables report values obtained under similar procedures and for similar municipalities it can be concluded that the noted changes in refuse composition are representative of the larger communities.

The most significant physical properties of refuse are density, moisture content, % of combustibles, % of putrescibles, % of compostables, calorific values, % of salvables, presence of over-large materials, and extent of materials such as wiring and synthetics that may foul up mechanisms. The importance of each of these will vary with the type of collection equipment used, the disposal methods proposed, or the salvaging operations contemplated. Accordingly, before planning its collection and/or disposal or reclamation facilities, a given community should make specific analyses of these refuse properties which are pertinent to the problems under study.

The range of the more important properties of unsegregated refuse can be substantial, thus:

Density	200 to 700 lbs. per cu. yd.
Total Moisture	15 to 35%
Calorific Value	3000 to 5500 BTU per lb.
Combustibles	50 to 75%
Putrescibles	5 to 25%
Compostables	30 to 60%
Fines (under 3/4 in.)	10 to 20%

The chemical or "ultimate" analysis is primarily of significance in the design of incinerator or composting plants. In view of the heterogeneous character of refuse and its seasonal and annual changes it would be foolhardy to design such plants on the basis of heat and mass balance computations geared to single or a few chemical and physical analyses. The prudent designer should run a series of such thermodynamic calculations assuming for each series the most critical physical and chemical properties. The magnitude and complexity of such calculations is beyond the scope of the Paper.

SPECIAL WASTES

To complete this discussion on solid wastes quantities and composition it is proper to point up certain relatively new special wastes which have become either quite sizeable as to amounts or are troublesome becuase of their peculiar or hazardous nature. There exists but little information about their quantities or characteristics. Some of these new wastes are:

1) Demolition and construction wastes - Last decade's vast programs of highway construction, slum clearance and urban redevelopment have produced huge quantities of burnable and non-burnable wastes. Non-burnables (masonry, rubble, plaster, tile, dirt and stone) being inert are readily disposed without creating nuisances or hazards but require land or water sites for dumping. The burnables pose a more serious problem. Their on-site burning creates air pollution and poses fire hazards. Their disposal at landfills creates voids, provides harborage for rodents, poses future fire hazards, differential settlement problems and probably foundation difficulties. Possible solutions include: 1) at least partial salvage and reclamation, 2) shredding and burning in municipal incinerators under controlled conditions, and 3) burning in bulk in specially designed central incinerators.

2) Out-sized wastes - Over-large materials such as furniture, refrigerators and stoves; tree branches, trunks and stumps; driftwood; Christmas trees; abandoned vehicles; rubber tires; etc., cannot be collected or disposed of by normal methods. Special preprocessing methods such as shredding will have to be developed.

3) Synthetic wastes - There exists a limitless number of chemical and plastic wastes including plastic building materials. The degree of their burnability, decomposability, corrosiveness and hazardness is unknown.

4) Radio-active wastes - There highly specialized wastes are not, at this time, within the purview or responsibility of the municipality. Their handling is generally assumed by special Federal Government Agencies. Should they become in some part a municipal obligation much information as to their amounts and properties will be needed.

5) Incinerator flyash and ash residues - The advent of the ever increasing burning of refuse in various type, small and large incinerators, is producing ever larger amounts of residuals. None-the-less, very little is known about their exact quantities and composition. Knowledge on their densities, chemical properties, combustible and putrescible content, the amount and character of metallics, their alkalinity or acidity, seive analysis and other related characteristics is essential in designing efficient handling apparatus and developing proper disposal methods and possible reclamation.

TABLE 1*

TOTAL REFUSE COLLECTED IN 12 UNITED STATES CITIES, 1957-1958[1]

City	Pounds per Capita per Year	Pounds per Capita per Day
St. Petersburg, Florida	1,690	4.63
Los Angeles, California	1,677	4.61
Washington, D. C.	1,638	4.36
Chandler, Arizona	1,587	4.35
Garden City, New York	1,438	3.94
Hartford, Connecticut	1,430	3.92
Seattle, Washington	1,370	3.75
Omaha, Nebraska	1,370	3.75
New York, New York	1,325	3.63
Atlanta, Georgia	1,252	3.43
Cincinnati, Ohio	1,103	3.03
San Francisco, California[2]	794	2.18

1. Includes refuse actually collected, regardless of the method of collection or disposal. It does not include automobile bodies, cinders, and bones and fats; since they are usually salvaged before collection and sold, they cannot be considered wastes. Apartment house incinerator ash is calculated in terms of equivalent amounts of refuse.

2. San Francisco is set apart from the other 11 cities because it is the only one in which the householder is charged for refuse collection on the basis of quantity. The method of charging is an incentive for the householder to dispose of as much refuse as possible on his premises. Thus the figure for the amount collected is much lower than it is in other cities.

*From APWA Manual "Municipal Refuse Disposal"

TABLE 2

MONTHLY DISTRIBUTION BY WEIGHT OF ORGANIC AND INORGANIC REFUSE DISPOSED OF IN NEW YORK CITY, 1939

Per Cent By Weight

	Organic					Inorganic			
Month	Garbage	Misc.	Paper	Wood	Total	Metal	Glass	Ashes	Total
January	5.7	1.0	12.4	0.3	19.4	4.3	4.0	72.3	80.6
February	9.0	1.7	12.6	0.7	24.0	6.6	4.9	64.5	76.0
March	9.7	2.1	20.6	0.3	32.7	7.4	7.3	52.6	67.3
April	18.1	2.8	21.6	2.0	44.5	7.4	6.9	41.2	55.5
May	26.7	3.3	23.0	3.1	56.1	7.1	6.8	30.0	43.9
June	35.1	3.8	24.3	4.6	67.8	6.4	6.8	19.0	32.2
July	43.8	4.1	25.5	5.9	79.3	6.6	6.3	7.8	20.7
August	23.1	7.4	37.6	3.8	71.9	11.6	5.1	11.4	28.1
September	12.6	5.6	26.7	4.9	49.8	8.2	9.1	32.9	50.2
October	10.1	3.8	31.0	2.6	47.5	8.9	4.0	39.6	52.5
November	6.6	1.9	18.0	2.1	28.6	3.8	2.9	64.7	71.4
December	3.5	0.8	9.0	0.8	14.1	3.1	1.9	80.9	85.9
Average	17.0	3.2	21.9	2.6	44.7	6.8	5.5	43.0	55.3

TABLE 3**

PHYSICAL ANALYSIS OF REFUSE BY WEIGHT, CHICAGO 1956-58

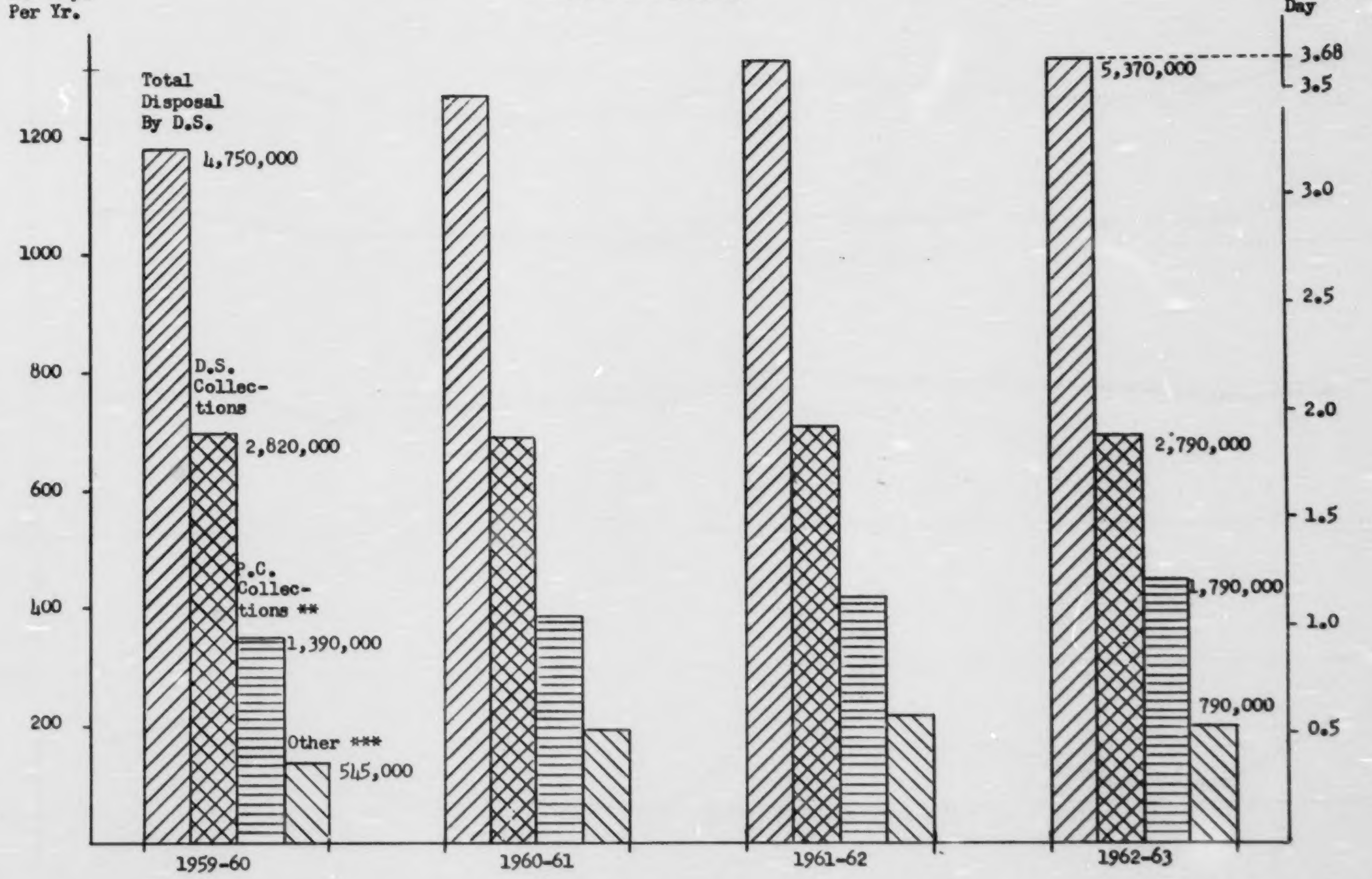
Date	Number of Samples[1]	Per Cent By Weight Paper	Grass	Garbage	Metal	Glass	Ashes
3/56	10	50.1	*	6.4	18.5		25.0
4/56	8	64.0	...	7.4	13.9		14.7
5/56	9	57.3	11.9	5.6	14.0		11.2
6/56	6	60.7	6.5	2.5	13.6		16.7
10/56	6	56.0	4.5	3.5	11.9		24.1
2 & 3/57	4	49.2	...	6.1	17.5		27.2
4/57	1	53.3	19.7	3.2	9.3	5.9	8.6
9/57	2	42.0	23.0	3.6	7.4	5.4	18.6
11/57	1	59.3	3.7	2.3	5.2	6.5	23.0
2/58	1	57.6	...	5.7	11.6	9.3	15.8
2/58	1	56.3	...	1.5	7.5	6.0	28.7
2/58	1	70.4	...	2.6	8.0	6.9	12.1
4/58	3	63.7	...	1.5	8.1	5.8	20.9
5/58	1	54.7	34.4	0.8	6.2	3.5	0.4
Average		56.5	9.6	4.8	14.8		18.7

[1] One sample consists of one truck load of refuse (approximately three tons).

* Analysis for this category not performed; grass included with paper.

** From APWA Manual "Municipal Refuse Disposal".

FIGURE 1
ANNUAL TONNAGE RECEIPTS FOR DISPOSAL AT D.S. FACILITIES *
SINCE INSTALLATION OF ELECTRONIC SCALES
1959-60 TO 1962-63



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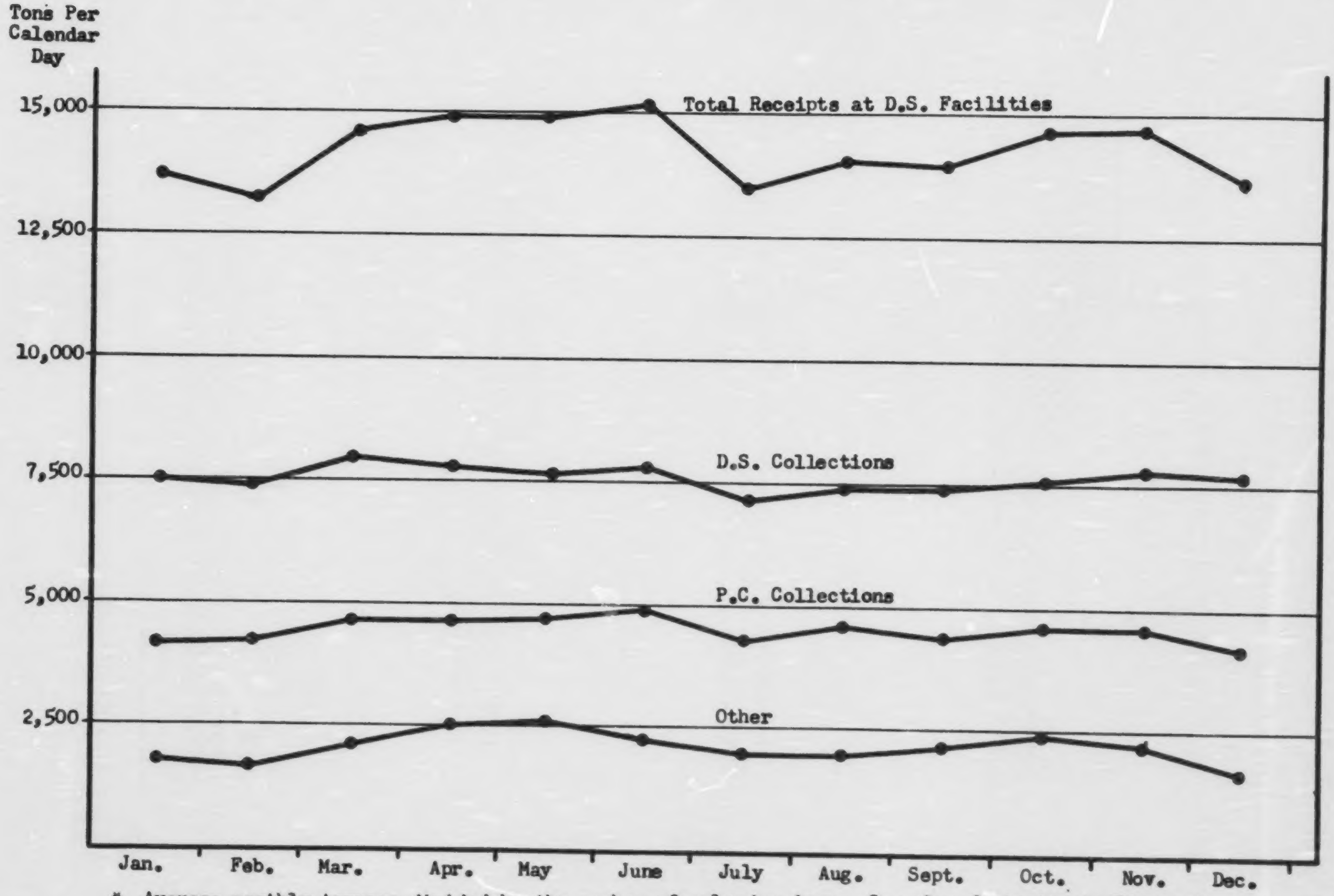
* Disposal quantities at D.S. facilities do not include waste material going to rendering plants and piggeries and self-disposed ashes, construction waste and various industrial wastes all of which are estimated to amount to about 1,000,000 tons annually. D.S. collected residue from apartment house incineration, included in figures used in chart, is estimated as equivalent to about 450,000 tons of refuse.

** Collection of commercial waste by private cartmen.

*** "Other" includes material from federal, state and other city agencies and construction waste. Substantial amounts of burnable construction waste are burned on site. Most non-burnable construction waste is used in private landfilling. Such quantities are not included in this chart.

FIGURE 2
SEASONAL PATTERN OF DISPOSAL AT D.S. FACILITIES
AVERAGE TONS PER CALENDAR DAY *
1960 - 1963



* Average monthly tonnage divided by the number of calendar days. See also footnotes to Figure 1.

NOTES TO TABLE ON PRODUCTION, COLLECTION AND DISPOSAL OF REFUSE

While known tonnages are for the year 1964-65, variations between contiguous years are usually slight, and consequently the data are generally representative of a 5 year period centering on 1964-65.

A. Accuracy of data.

The tonnage in column 13 of the third line is a firm figure, based on weighings at municipal disposal facilities. Within the third line, however, the figures in cols. 2, 3, and 7 represent only educated guesses. The same comment applies also to cols. 8 and 10 of the second line.

B. Comments on specific entries.

a) Columns 1 and 3 of first line, and columns 1 and 4 of second and third lines:

Of the mixed refuse (col. 3, line 1) which is produced in facilities of other governmental agencies and institutions, about 120,000 tons is municipally collected. This accounts for the adjustments in the above columns of the second and third lines.

b) Column 2;

Residue of domestic (apartment house) incinerators is collected and disposed of by municipal collection forces. Of the 172,000 tons of residue shown in this column, about 37,000 tons is collected in separate unmixed loads. The balance (135,000 tons) is collected in loads of mixed refuse.

c) Column 3, second and third lines:

The bulk of ashes are collected with mixed refuse loads. Only 8,000 of the 13,000 tons separately collected are salvaged by sale.

d) Column 6:

Several factors account for the differences in this column on each of the lines. Of the 1,605,000 tons of commercial and industrial production of garbage, rubbish and bulky junk shown in the first line, some 193,000 tons (non-putrescible) are self-collected and are shown in col. 9 of the second and third lines. An estimated 249,000 tons of the 1,412,000 tons shown in the second line are hauled to New Jersey for disposal. Another 1,000 tons of the self-collected (col. 9 of second line) are taken to New Jersey.

e) Col. 12 of second and third lines, and col. 11 of first line:

It is estimated that some 100,000 tons of burnable construction waste over and above the 140,000 tons disposed of in municipal facilities, as shown in the third line, are produced and disposed of in a variety of other ways. Until January 1, 1965 it was permissible for contractors to burn materials on the demolition site, but this is no longer legal. It is estimated that about 25,000 tons of pier demolition and other construction wastes (included in the 240,000 ton total) are taken to sea on barges and burned.

Table 4

REFUSE TONNAGES ANNUALLY PRODUCED, COLLECTED AND MUNICIPALLY DISPOSED OF IN NEW YORK CITY (1964-65)

(Excluding Self-disposed Industrial Wastes, Non-burnable Construction and Demolition Wastes and Abandoned Automobiles)

TOTAL REFUSE (SOLID WASTES) PRODUCED

By Households		By Government and Institutions			By Commerce and Industry						Total		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Municipally Collected Garbage, Rubbish & Bulky Junk	*Garbage & Rubbish Burned in Domest. Incin. (Res. 172,000)	Garbage, Rubbish & Bulky Junk	Ashes	Grit, Rakings, & Grease from Sewage Treatment Works	Garbage, Rubbish & Bulky Junk	Ashes	Swill	Fats, Bones, Animals, etc.	Fly Ash from Power Plant Operation	Burnable Construction & Demolition Waste	Amount	Pounds per Capita per Year	Pounds per Capita per Calendar Day
2,781,000	766,000	384,000	50,000	38,000	1,605,000	100,000	40,000	200,000	324,000	240,000	6,528,000	1632.0	4.47

TOTAL REFUSE (SOLID WASTES) COLLECTED

Municipally Collected			Collected by Oth. Government & Institutions		Collected by Private Cartmen			Self-collected by Commerce and Industry				Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Garbage, Rubbish & Bulky Junk	Domestic Incinerator Residue	Ashes	Rubbish & Bulky Junk	Grit, Rakings & Grease from Sewage Treatment Works	Garbage, Rubbish & Bulky Junk	Ashes	Swill (Separately Collected for Disposal at Piggeries)	Rubbish & Bulky Junk	Fats, Bones, Animals, etc. (Collected & Disposed of by Private Industry in Mfg. Fertilizers)	Fly Ash from Power Plant Operation (80% Dumped at sea)	Burnable Construction & Demolition Waste	Amount	Pounds per Capita per Calendar Day
2,901,000	172,000	50,000	264,000	38,000	1,412,000	100,000	40,000	193,000	200,000	324,000	240,000	5,934,000	4.06

TOTAL REFUSE (SOLID WASTES) MUNICIPALLY DISPOSED OF

From Municipal Collections			From Other Government & Institutions		From Private Cartmen Collections			From Commerce and Industry Self-collections				Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Garbage, Rubbish & Bulky Junk	Domestic Incinerator Residue	Ashes (8,000 sold)	Rubbish & Bulky Junk	Grit, Rakings & Grease from Sewage Treatment Works	Garbage, Rubbish & Bulky Junk	Ashes		Rubbish & Bulky Junk			Burnable Construction & Demolition Waste	Amount	Pounds per Capita per Calendar Day
2,901,000	172,000	50,000	264,000	38,000	1,163,000	100,000		192,000			140,000	5,020,000	3.44

CHAIRMAN ROBINSON: We have some time left. I would like, if you have questions, comments, or contradictions, to come forward and we will get Mr. Rogus back up here.

FROM THE FLOOR: I noticed on the schedule for 1939 in New York in December, the garbage collections amounted to a little over three pounds per person, and in July it was four pounds. Are the New Yorkers hungrier in July?

MR. ROGUS: If I had the gift of Mr. Tucker and could tell a story, I think there would be some way to answer that. All I can say is that those are the facts. What the background is, I am at a loss to say at this moment.

FROM THE FLOOR: On your first slide in the compilation of the waste figures, why was there such a drastic change between June and July? That was on the first slide.

MR. ROGUS: That showed that the lowest total amount of material brought in for disposal was in the months of February, July, and August. I would say that there is an upsurgence in the spring months of April, May, and June and I think that upsurgence for those three months is accounted for largely by spring cleaning, gardening, and similar activities. Of course, the similar activities in the fall may account for that.

The drop off in the summer months can be accounted for in part, as Mr. Flood points out, by an outgoing of the citizenry, but that, in part, is compensated for by the incoming of some of the vacationers that come into New York.

Some of it may be accounted for by a drop off in the ash content, although that is actually very small, anyway. That is about all I can tell you, I am sorry.

FROM THE FLOOR: I might elaborate on that. My experience has been that in June, they get through trimming their grass, their hedges, their trees, and so forth, and you have a complete drop off of trimmings and so forth.

Even the grass starts to deteriorate, they don't cut it as often, plus the fact that there is an upsurge of fresh vegetables that the grinders take care of in a lot of places, and there is less shipping because people buy, as your merchants will tell you in most cities, July and August are lousy months to sell anything. The amount of paper and even newspaper drops off.

I started digging into this some years ago, and they seem to be some of the factors that contribute to this drop-off in June and July.

MR. ROGUS: Yes, I would agree with that analysis that there are various and sundry things, no one of which is very important, but each small factor seems to have an influence.

FROM THE FLOOR: You mentioned your own personal observation of the change in European garbage, the content of it, that it is more nearly approaching our type of garbage than heretofore.

A recent article in the American City was talking about the failure in some parts of Arizona to compost garbage. They said the Europeans were described as being very successful in the use of compost for the disposal of garbage because of the larger amount of garbage.

Have you found that the composting reflects the change in the nature of the refuse? Has the composting become less efficient than it was before?

MR. ROGUS: Mr. Robinson suggests that I leave that to the composting people, and I will. I will, however, make this comment:

On this trip, I did not observe any composting plants. I think Ralph Black can comment on this a little more than I can. However, I think this may be a pertinent observation. At least it is this one man's opinion that composting perhaps is more successful in Europe than it is here, but the reasons are not so much the know-how, but the other circumstances and primarily one of the salability of the end product in Europe more so than here, and one very important factor that composting in Europe is still by far the most successful in the Netherlands is because of the land which has been reclaimed from the sea, largely as an instrumentality for the means of reclaiming the vast acreages of land that they reclaimed from the salt water marshes.

Once they reclaim the land, they use these organic materials for several years for getting the better soils, et cetera.

CHAIRMAN ROBINSON: The entire morning of Wednesday is going to be devoted to composting, so if you have questions on composting, would you hold them until then?

FROM THE FLOOR: Is there any such thing as a research establishment publishing the disposal methods adequate to the synthetic waste which you mentioned, the miscellaneous synthetic wastes which are cropping up all the time?

MR. ROGUS: Frankly, I do not know of any research being done on any government controlled basis, but I very much suspect that the individual industries that generate such wastes, at least in part, are probably making such research of sheer necessity.

I know that in the City of New York, we actually have to turn down some of the wastes that are being offered to us because it was so hazardous in many ways.

Obviously, they either exported them elsewhere or they had to seek means of self-disposal.

Perhaps someone else, particularly from the federal government, could answer that matter better than I can.

CHAIRMAN ROBINSON: I might say that Friday afternoon we will hear about current and proposed research in the disposal of synthetic solid wastes. Maybe that could be answered at that time for you.

FROM THE FLOOR: I have a two-part question. In your demolition program, are the combustibles separated at the demolition site.

Second question. How do you handle your large combustible pieces such as large timbers?

MR. ROGUS: We have such a question. No. 1, yes, to the best of practicability, the burnables are separated. This refers to construction and demolition waste.

The answer to the second question, what do we do with them, the answer is in two parts: At the moment, by law, we cannot burn them or the demolition contractors cannot burn them on the site. By law, the problem of disposal has been handed over to the Department of Sanitation. Our interim solution consists of burning them at our several sanitary landfill points under some controlled measures.

The second part of the answer to the second question is that we, in order to give impact of objectivity, are studying this problem through consulting engineers, and their answers are almost in as to what is the size of this problem.

As I recall the size of the problem on the oversized burnable wastes for New York City approximate one hundred pounds per capita per year. That is the magnitude.

So far as method of disposal is concerned, they have explored various methods, and without revealing the answers, perhaps prematurely, I am of the opinion that the proposed future methods will be akin to those used in Europe. That is, by using big crushers of suitable types of breaking these burnables down to sizes which can be handled in the modern incinerator.

MR. RALPH BLACK: Not a question, but a comment.

Cass has given us the warning that the range here might be quite marked. I just want to throw in here that we have recently gotten a copy of a report that was made in the bay area of San Francisco of some six counties, and the quantities were kept separate for each county.

Interestingly enough, one of the counties, by actual weighing found they were getting a per capita production of 18.3 pounds per calendar day. This is due to local concentration of industry and agriculture, but it can be quite a marked variation.

MR. ROGUS: Thank you.

FROM THE FLOOR: Is any disposal of garbage or refuse in the New York area done by dumping it at sea?

MR. ROGUS: No garbage is dumped at sea. That was discontinued by the United States Supreme Court by decree in 1934. Prior to 1934, a very, very substantial amount -- in fact, most of the refuse of the City of New York was taken out in flat type barges some distance out to sea and dumped, but that dumping created obvious pollution and sanitary problems because much of it was washed out on the adjoining beaches, and the State of New Jersey in particular sued and the United States Supreme Court stopped that operation.

However, the people get quite confused at times insofar as New York City is concerned because they do see a lot of barges operating.

The barges that the sanitation department operate, and we operate 42 large barges which contain 2500 cubic yards each, these barges are simply transporting the refuse from a transfer station -- and there are ten of them dispersed throughout the city -- and they transport this refuse to Fresh Kills. This is in Staten Island where the refuse is unloaded from the barges and is disposed of by sanitary land-fill methods on a 3000 ac[illegible] We have been operating there since 1948, and we have got about fi[illegible] more years to go.

In substance, therefore, roughly about three-eighths of our refuse is disposed of by barging from the various local areas in the city to this area at Fresh Kills. There the refuse is unloaded and disposed of on this 3000-acre site by filling in by sanitary control methods to depths up to 45 feet, thereby reclaiming this vast area of non-usable marshy lands that were just a nuisance and were absolutely non-usable, and they are being converted to useful means so that the long-range program envisages that this particular area will be eventually transformed partially to residence, partially to industrial and partially to recreational usages.

FROM THE FLOOR: When I was visiting New York some years ago, I saw a barge burning. Do you incinerate any of these wastes in transit by burning?

MR. ROGUS: There are two types of burning operations that are taking place in the barges, at sea, and one of them is in the bay and the burning there we blame on the federal government. The United States Coast Guard, United States Engineers, collect the floating debris in the bay because it is a navigational hazard and dispose of it by burning it on this flat decked type of a barge in the lower bay.

Unfortunately, we are frequently blamed for this, but we have nothing to do with that part of it.

The second type of burning you can blame in part, at least, on Mr. Flood, the Air Pollution Control Department. The City of New York is doing a great deal of reconstruction along the waterfronts of the old piers and sheds and what-have-you and there, under an interim solution, on the special permit and control of the Department of Air Pollution Control, these materials, these burnable materials are handled by private contractors. They are towed out to about a mile and a half or two miles off the Staten Island shore and they are burned under proper conditions of weather, wind, and what-have-you.

It is not sanctioned. It is tolerated. That is the reason we are going through the study that I mentioned previously because it is acknowledged that these are not the best methods, that these interim solutions need rectification and we hope to accomplish something through these studies.

CHAIRMAN ROBINSON: That is all the time we have for questions.

ON SITE DEVELOPMENT

PANEL

MESSRS. SHAYNE, E. H. TAYLOR, AND WATSON

The Monday afternoon session of the Seminar convened on September 20, 1965, at 1:00 P.M., C. M. Robinson presiding.

. . . Mr. Robinson introduced Mr. P. E. Shayne, who is Executive Secretary of the Detachable Container Association, Washington, D. C.

MR. SHAYNE: Good afternoon, gentlemen. I am here representing the Detachable Container Association from Washington, D. C. I am a refuse disposal contractor. My two brothers and I operate a fleet of eighty-six vehicles. I think it represents an investment of over a million and a half dollars. We try to set a good example which means that when you go to Washington, D. C., you will probably see several of our modern trucks, and on each truck there is a picture of three men in a row, each one carrying a garbage can. I am the one in the middle, the one with the glasses.

We pick up refuse from the White House. We have a containerized service there. For some reason, they always pay their bills a little late, but they pay during the current month. We refer to the White House trash as Democratic dirt. During a Republican administration, we refer to it as Republican rubbish.

On my far left, we have Mr. Pat E. H. Taylor, market division manager, paper shipping Sack Manufacturers' Association, Incorporated, New York City.

This is Mr. Kenneth S. Watson, manager of the water laboratory of General Electric Company, Louisville, Kentucky. They shall speak later after I have concluded.

This panel is concerned with ON-SITE DEVELOPMENTS of solid waste, on-site meaning any home, commercial or industrial area where solid wastes are stored or handled in any way, and regulations regarding these areas. Our purpose here today is to speak on these subjects and to answer your questions.

I hope to define the problems of the commercial and industrial aspects of solid waste and to come up with some solutions that can be applied immediately to these problems. I also hope to lay the groundwork for development of long-range solutions necessary to solve our present and future problems, and in cooperation with others of the refuse removal industry, to clear up problems such as disposal methods at open dumps, sanitary land fills, incineration, and composting.

With these points in mind, I would like to say a few words about the equipment and service we now have. The Detachable Container Association is an organization representing a group of trash removal contractors from all parts of the country who provide containerized service to industrial and commercial customers. Our association was started in 1952.

Our containers are nothing more than fancy trash cans in which the customers deposit the trash. The filled containers are then emptied mechanically into large compaction trucks and taken to an incinerator, a landfill, or a dump.

The various sizes and types of containers are available and there are several types of trucks to handle these containers.

Most of you gentlemen have college degrees from universities here in the United States. In the early days of America, however, most of the gentry sent their sons to Edinburgh, Scotland, for their university education. At that time, Edinburgh was called the Athens Father of the North, and in that day of civilization, they had their problems with on-site waste disposal. They also had the high-rise apartment buildings. Here is something written about Edinburgh, Scotland, two hundred years ago.

"Late at night, at the curfew hour, far overhead the windows open five, six, or ten stories in the air and discharge the collected garbage of the last twenty-four hours into the street. It was good manners for those above to cry, 'Guard below,' before throwing anything out.

"Those returning home from the taverns always called back, 'Hold your hand,' and ran.

"They say this is another reason why gentlemen were forced by the good ladies to walk on the outside of the sidewalk.

"The ordure thus sent down lay in the broad high street making the night air horrible until early in the morning when it was cleared away by the city guards, and the city guard did not work, of course, on the Sabbath."

Here in America today we have solved many of the old problems, but we have new problems. In the Refuse Journal they reported an unsightly incident in Newark, New Jersey as a result of a strike by maintenance workers. Debris had accumulated for a week in some of the places. It took fifteen men and two trucks two days to clear up the mess, and the apartment management has been billed for it. If they refuse to honor the bill, a lien will be placed on the property according to a city official.

Some areas put their garbage or trash removal costs with the water bill. In our particular area, they also do this and we have a little common joke saying that if we don't pay our trash bill, we will have our water cut off.

I am sure all of you have read from time to time such stories in your local newspapers, many resulting in serious and long standing and detrimental effects. This is a sad state of affairs. I want everyone to know that my association, and many others like mine, do have the facilities and manpower to handle some of the problems of solid waste disposal from on-site dumping.

One of the latest inventions is a self-contained refuse compactor that compacts the refuse on site. These containers force refuse under 68,000 pounds of hydraulic pressure, thereby reducing bulk on a four to one ratio. The advantages of these on-site compactors are numerous. There is no air pollution, no daily collections, no extra personnel handling the refuse, no need to separate the different types of refuse, and building each storage in a different place is possible.

This leads to some cost saving, improving the operation, providing maximum community cleanliness, and beauty, and people should become more aware of it.

These refuse compactors are, of course, ideal for industrial use. Smaller units are also available for businesses and apartment houses here and elsewhere.

Here we have a wide variety of equipment to handle every requirement. There are six basic types of detachable containers used in our system. I would like to point them out to you in a minute.

Type one is the LC, lift and carry. The container is lifted at site. It is filled, picked up by the truck, truck takes filled container to the trucking site. Truck brings empty container back to the site, container sizes available from two to twenty-two cubic yard capacity.

The originator of this type system was the Dempster-Dumpster. This is the kind of service we furnish to the White House. They are also made by Cobey. Gar-Wood has recently got into the field along with several others.

Type two is the SL or side loader. The container is lifted at the site. The filled container is rolled to the truck, and the filled container is lifted over the side of the truck, picked up and emptied, and container sizes available are one to three cubic yards. There are several manufacturers of this. As a matter of fact, our company was one of the guinea pigs in America for this type of service.

Type three is the RL or rear loader. The container is lifted at the site. The containers are then rolled to the rear of the truck. The lifting mechanism at the rear of the truck lifts the containers up and empties the containers at the corner. The containers are rolled back to generation point. The roll-out container sizes available are one to three cubic yards. There are other sizes, three to eight cubic yards, using a cable attachment to dump the container in the back of the truck. There are quite a few manufacturers of this. There is the Leech, the Gar-Wood, the Easy-Pack, Daybrook, and many others. Perhaps there are some alley mechanics that work on this as well, trying to develop this type of system.

Type four is the FL, and this is the one that really costs a lot of money for either the city or the contractor. This is known as the front loader. The container is lifted at the site. The truck driver drives up to the container, raises the forks on each side of the container, and the pick-up takes the load, mechanically picks it up, carries it over the cab and dumps the contents into the top of the truck. The empty container is then moved to the ground, the truck backs away. There is no handling of the container by personnel.

The container sizes available are one to ten cubic yards. As a matter of fact, the first one on the market, I believe, was on the west coast and the Dempster brothers of Nashville, Tennessee, developed a good system. A gentleman working for us in our research and development department developed a front loader that has an automatic leveling device and there is less wear and tear on the truck.

We have licensed a firm in Galion, Ohio, to build this particular type of front-end loader for which we get a little royalty.

Type five. Roll-off system. This is the open top container. It can also have lids on it. It is lifted at the site, normally on a loading platform. It is a truck with a winch attachment and the driver attaches the winch and gets the body to go up on the chassis frame. He pulls it onto the chassis by use of the winch. There is also one hydraulic system available in this type of equipment.

The container is then taken to the disposal site and dumped with the underbody hoist. Then, the original container is brought back to the original generation point.

The container sizes available are fifteen to forty cubic yard capacity. There is about a four-to-one compaction on this, depending on the nature of the trash that is being loaded.

This is the latest thing, the type six. This is the stationary compactor which is permanently installed at the generation point. The closed compactor container is attached to compactor containers of all five types of the preceding systems and can be used with various sizes of stationary compactors.

Refuse fed into compactor then is pushed under pressure into attached container. The filled container is then picked up, emptied with one of the aforementioned systems. Compactor hopper sizes range from three-fourths to six cubic yards. Container sizes available are from two to forty-five cubic yard capacity.

Our company has developed a compactor that helps eliminate air pollution. The trash comes down a chute. There is no incinerator in the building. When it comes down the chute, it breaks an electric eye switch and is compressed into a small container.

In addition to this, we have experimented with compacting on existing Dempster-Dumpster equipment put out by Hyle. One plant we have in Washington, D. C., is the Frito-Lay. We are not highly industrialized, but we do have the Frito-Lay plant. They have a hopper about two and a half cubic yards running into a container of about thirty-five cubic yards, and we actually pick up about eight to ten loads of payload.

You can see, gentlemen, from the preceding, containers are a big improvement over the old row of open trash cans which were even a greater improvement over the methods used in Edinburgh, Scotland, two hundred years ago.

People should be more aware that containers are fire proof, animal proof, rodent proof, and fairly free of flies and odors. They will hold more than the old-fashioned cans.

In these respects, container systems are contributing to the solution of our solid waste problems, but before containers can make their maximum contribution to the safe storage and transportation of solid waste, there are still more serious problems to be solved.

Containers represent a partial automation of the trash removal business, but the non-automatic parts are the source of our greatest problems, problems we cannot give to anyone else.

For example -- cleaning contractors. Actually, local health department authorities hold the customer responsible for keeping trash containers on his premises in a sanitary condition, but the customer demands the service of his trash removal contractor.

Cleaning out containers is no easy job. It requires manpower and time while the trucks stand idle. Presently, we are using a front unloading system that costs, without the finance charges, a minimum of $23,000. We have our own methods of keeping containers clean and sanitary. Scraping the inside of all residue, spraying with disinfectant with water under pressure, but it is a constant problem keeping after the men because most of us in this business run on an honor system. We can't very well get a receipt from every customer. We would never finish our work. We should have water and drains available on the site. This would be a better system.

Architects, builders, community planners, and law makers must be made aware of this problem and encouraged to include such facilities in their planning of new industrial plants, apartment houses and even private homes.

So far, it seems that the best solution to these on-site solid waste storage problems is a solid waste steel container which is practically impossible to dump without a truck equipped to handle it, and containers with self-closing lids and doors, so the problem remains of how to clean the containers easily, efficiently, and automatically. Until our engineers and scientists come up with such a solution, we will continue to use our present methods.

I would like to suggest to our engineers and chemists some method of cleaning the inside of the container that operates on that basis. Everytime some trash is emptied into it, especially foodstuffs, some chemical detergent disperses all around the sides, under pressure, disinfecting and sanitizing the interior walls as the container stands waiting to be picked up. The operation of this unit could be designed to take place for a minute or less and automatically shut off, and automatically should close, should the lid be raised again before the cycle is complete.

More improvements also could be made in the container itself. Right now the best material we have is steel coated with paint. We recommend a high tensile strength steel. Most of the manufacturers of containers do not make them out of high tensile steel, and there are quite a few alley welding shops that are making containers as well.

Research so far has not proven aluminum or Fiberglas any better, but a lighter weight non-corrosive container would be an improvement. As long as steel containers are used, there is improvement needed for the paint. Our containers have to be painted on the average of every twelve months. I am not trying to quote figures, but I think we have in the city of Washington about four thousand detachable containers that we have built up over a period since 1946. We are literally cleaning up Washington.

Some companies are using rust-proof undercoating. A long wear coating of this kind would help solve the problem. By the way, we had the same problems in December of 1963 when I spoke in Chicago.

The problem that faces our industry and has for sometime is our personnel. How do you recruit trained personnel? How do you hold them when you have them trained? You need the kind of personnel who can be responsible for operating this expensive equipment. After all, we don't have college graduates. How do you make him feel he is an important man, and is a part of an important service to industry, business, and his fellow man?

Another thing, what title do you give him? Garbage man? Trash man? Sanitation engineer? That last one would infringe on those who have been to college and majored in the subject.

We must get away from false notions of importance, prestige, and status. We must call them what they are without degrading or downgrading them. In the meantime, it may be well for all of us to find a better term than garbage man.

Beyond all this, a look at the future tells us that research and development in the detachable container systems industry, as well as in refuse disposal, needs to be looked at hard and long. As we already know, landfill sites are disappearing, open dump areas are getting scarce and being located further and further away.

Just recently, I read that Denver, Colorado, is building a $314,000 trash transfer station located on the outskirts so that trash can be transferred there to be sent to the disposal area 12 miles away. That is a lot of money to spend on a building to hold transport trash. Lacking any better or less expensive solution, they did the best they could.

Science fiction writers are even taking a look at this problem. Some have envisioned people digging their way to ground level in New York City through trash as high as the Empire State Building.

Space scientists are talking of refining wastes and converting and reconstituting them into synthetic edibles, but I do hope we live to see a day of safe, sanitary economical storage, handling and disposing of solid wastes that are satisfactory to everyone, where every home, every store, every building has ideal on-site disposal systems.

One solution that probably could be applied in the near future would be to incorporate these wastes into the sewage system. However, that will take more water, and conservation of water is another problem that is getting more and more attention these days. I was lucky enough to go to the World's Fair a few weeks ago and stay at a New York hotel. Of course, as a lot of you know, when you are sitting down in a restaurant, they only give you water if you order it. They also turn off the air conditioning in the hotels during certain times of the day. They do have a big problem. We also know it is a very large national problem.

Scientists have also offered a plan of dissolving trash in acid solution, but many people shun this planning as being too wasteful. Perhaps we could use the ideas of some of the science fiction writers today if we would adopt them. There might be a type of disintergration system developed to burn up foodstuffs and yet separate out valuable chemicals and minerals.

Take a look at what trash contains. In the area of metals, one of our national resources that we cannot recover, there is iron, copper, carbon, silver -- yes, silver, and even a bit of gold now and then. A system like this, if it could be developed, would make a contribution to the conservation of our natural resources. Such a system could be developed on the site or in our own plants, still picking up and dumping trash as we are now doing, but there is another problem and more properly belongs in the discussion of our incineration panel.

I would also like to mention briefly some other problems. Number one, how to make people aware of this long-range problem of solid wastes.

Number two, how to educate the people in handling solid wastes, Solid waste, as we pretty well know, is the removal of a nuisance. People don't think it is too difficult to take care of. They do not believe that there is any cost involved.

Number three, how to get law-makers and architects to incorporate facilities to handle solid wastes in new communities and new buildings. People in our industry invariably see where a new building goes up -- like in Washington, we have had a lot of high-rise office buildings and apartment houses and there are no provisions made many times for handling the refuse.

Number four, how to get financial support for any long-range project.

My personal solution to number one in the Detachable Container Association is advertising and public relations. Our association is currently engaged in an advertising campaign in the print media. This primarily covers newspapers and the yellow pages of phone books. This, I feel, is adequate for our localities. However, I would like to see some kind of a national campaign, perhaps including billboards, radio, television, posters, magazine articles, books, newspapers, editorials, and direct mail.

This national campaign might emphasize the overall problems of solid wastes, how to dispose of them, how to develop on-site facilities with public interest a basic consideration.

Mr. Tucker, your earlier speaker, hit the nail on the head when he referred to this industry as a public utility service because we are concerned with health, air pollution, and fire prevention aspects. We have a mission to perform. It is up to all of us to act, to get action.

This national campaign naturally could not be financed by my association alone. Perhaps it could be a campaign with our association and we also have approximately ten associate members who are fairly large manufacturers, but together we all would be able to contribute enough financial support to develop and carry out a large impact. With such a national campaign, the problems we face in our industry would also come to the attention of architects, builders, redevelopment authorities, and legislative bodies all over the nation from the municipal level to the national level in Washington. The people would become aware that there is a problem and a very large one. Such a campaign would educate people on a national basis.

To sum up, our problem today with on-site solid waste disposal not only involves the mechanical aspects as I have delineated them here for you and some personnel problems, but also involves the largest factor of all which is education. Education of all the people in how to handle solid waste, awareness of the officials in all levels of government and industry that there is a problem and that something can be done and should be done about it.

Without an insistent voice and a push from the people themselves, we are apt to take too long to coordinate our findings and to develop workable plans that can be initiated in the very near future, so in order to get that needed incentive and to bring this matter to the attention of those who may be financially able to support some long-range programs, I propose a national coordinated advertising public relations campaign financed cooperatively within our industry.

Let's hear your views on this. Thank you.

Before we get into the question-and-answer period, I would like to give a biographic sketch of Mr. Pat E. H. Taylor. Mr. Taylor is executive director of the National Refuse Sack Council, headquartered in New York City. He received his Bachelor of Arts degree in 1959, after his education had been interrupted for four years while he was a jet pilot in Korea and Japan.

After gaining eight years of experience in the production, planning, technical sales and development services for multi-wall sacks, Mr. Taylor joined the Paper Sack Manufacturers Association in 1963 as market development manager. His investigation indicated a great potential in refuse sacks, the use of which was growing in several European countries.

In the spring of 1964, he conducted an extensive personal study of paper refuse sack systems in several European countries and attended the International Public Cleansing Conference in Vienna. Results of these studies resulted in the National Refuse Sack Association of which he is the Executive Director.

I would like to introduce to you Mr. Pat Taylor.

MR. TAYLOR: Thank you, Bill.

You all have some material which I placed on your desk while you were out to lunch which will cover a great deal of the material in detail of our wonderful way of disposal of refuse which we refer to as the paper refuse sack.

I will also answer questions if you care to ask them directly here, and after the session is completed. I have a film which was produced in Australia concerning the test of the use of paper refuse sacks in a city there, which we will show after the conslusion of this session at 4:30 for those who are interested.

Sometimes it is easier to change a system than it is to change human nature, as the case with refuse storage in the typical household. Among those who share this view is Ralph Black who sits seven or eight rows back. Ralph has noted, and many of you will agree, that efforts to improve household practices usually only bring temporary results, and any lasting improvement to be made in solving the waste disposal problem must be made by new approaches which can be conducted throughout the community.

One possibility Ralph has suggested is the provision of suitable refuse containers as an integral part of the regular refuse collection system. Since Ralph made these statements a year ago, considerable data on the performance of paper refuse sacks has become available in municipalities, industries, and institutions who have adopted the sack system. Also, studies have been carried out by sanitation officials which are now available and which provide scientific comparison on several subjects concerning refuse sacks and the similar types of containers.

The sack system is a new concept in refuse handling. Basically, its effectiveness lies in the removal of the container along with the contents. This also means removal of many opportunities for deficient refuse practices. Under the refuse sack system, there no longer is a permanent container that attracts insects and other disease carriers. The householder no longer has the responsibility of supplying sufficient suitable containers and cleaning them. Control of odors, spillage, and noise is eliminated almost entirely from the system, with a minimum dependence on the cooperation of the householder and the collector.

For example, filled sacks don't clatter on sidewalks or clank when tossed into the collection truck. At the same time, sacks improve collection efficiency. Man hours are saved because of the lightweight of sacks, and refuse handling time is cut down, and no time is spent in returning the container to the storage site. The paper refuse sacks most commonly used are about three and a half feet high and has a capacity of over thirty gallons, will hold heavy loads of wet garbage, cans, bottles, and other wastes. Different types of sacks are produced for dry or wet refuse.

Special resins are added to the basic craft paper formula to provide what the papermakers call wet strength. As a result, sacks hold moisture and moist refuse and do not disintegrate when exposed to rain or snow. Because the sacks are also slightly porous, this admits the escape of some moisture so that garbage can dry out on the site awaiting delivery, and on the trucks being delivered to some degree. This means a reduction in moisture that contributes to the development of incipient larvae, reduction of weight to be transported, and less moisture to be dealt with at the incinerator, thereby increasing burning efficiency. When put into use, open sacks are supported on a variety of metal holders that have hinged tops, or other built-in closers. These eliminate the possibility of lost lids. They may be free standing, mounted, or equipped with wheels or casters, and they can be provided with complete metal inclosures.

The refuse sack concept originated in Sweden in the 1950s. Today they are in use in more than fifty per cent of the municipalities in Sweden. The system has also spread quite rapidly in Europe and is operating in cities and villages throughout England, France, Norway, as well as other European countries and in Australia and New Zealand.

Development of the total removal concept in this fashion has made substantial progress since the manufacturers have done some promotion of this type of sanitation control.

College Park, Maryland, with a population of twenty thousand people was the first American city to adopt the paper refuse sack system for community-wide collection service, and it now has been in use for three years. They have had that much experience with the system. Each household was equipped with one wall mounted holder and a supply of forty sacks was delivered at twenty-week intervals.

Two pick-up men in each truck crew quickly removed filled sacks from the holders, fold over the tops of the sacks and place them in clusters on one side of the street to await collection. Twice a week collectors go through the entire community and the collection is completed in four days instead of five, with one-third of the collectors being transferred to other duties.

Truck investment has also been reduced two-thirds by changing from the expensive compactor truck to special open trucks. Formerly there were as many as a hundred complaints a month about battered cans, missing lids, failure to return containers to the proper place. Complaints have now dwindled to fifteen to eighteen a month. Comparable gains have been reported by other municipalities. Their experiences bear out a report which was made to the American Public Works Association that after field tests were conducted in four different cities, Buffalo, New York; Sarasota, Florida; Fort Worth, Texas; and Dubuque, Iowa. The report stated that general potential benefit of the system are important enough to warrant serious consideration by many cities.

The usual practice by interested municipalities is to conduct a trial program in a representative residential area. Several dozen cities are conducting such tests now or are contemplating planning for this in the near future.

Skokie, Illinois, will commence a trial in 450 homes.

The paper refuse sack is also gaining acceptance very rapidly in industrial and institutional applications. After testing programs for one store, a New Jersey supermarket chain manager installed the system in all markets. The store manager involved in the test reported that sanitation improved, the store was neater, odors were reduced, time was saved.

He also reported no problems with the sacks as to durability during the four months of the testing program.

A quieter and more attractive lunch room atmosphere is reported by a major New York City bank which removed the metal receptables in the employees' cafeterias and replaced them with refuse sacks. Also, other cafeterias, medical research laboratories and the like report another benefit for office building installation. The refuse sacks go down elevators without giving off odors or other offensive indications of their contents.

A restaurant in Carney, New Jersey, which formerly needed fifteen metal cans for kitchen refuse now uses two sack units instead. It no longer runs out of containers during the weekend interruption of collection service. It stores a large supply in sacks in very little space.

School authorities in Frederick, Maryland, report paper refuse sacks are the easiest and most sanitary method of disposing of milk cartons and other refuse.

Two scientific studies involving paper refuse sacks have produced some interesting data. Just a few weeks ago at the annual meeting of the American Public Works Association in Los Angeles, California, public health authorities reported on a ten-week study. The subject was a comparison of potential fly production from different types of refuse container systems and the comparison was made by counting migrating fly larvae. The study indicated that paper refuse sacks could be more than ninety per cent effective in controlling fly population growth than conventional garbage cans.

A control specialist reported the findings. The study was reported to the American Public Works Association. Trying to educate the public to wrap garbage and keep containers and cans closed, in his words, "Just doesn't work."

He told the APWA even with increased frequency of collection, residue in the cans often provides a continuous medium for fly production. He states, "It seems obvious effective fly control must be built in the garbage storage and collection system," and concluded by saying, "Community-wide use of the sack system would suppress the fly population below the test level."

Larry Crane, later on this afternoon, will give a complete report on this study that was contained in a report from California.

Another test conducted over a one-year period at Manchester, England, looked into depositing of refuse in landfills. The report by that city's cleansing department states that the experiment confirmed that the effective tipping -- and tipping is dumping -- refuse in polyethylene sacks would slow down decomposition of the refuse contained therein, whereas refuse tipped in paper sacks would follow the normal pattern of decomposition expected with the household refuse in bulk. Refuse sack operations in municipal and private systems have drawn uniformly favorable comments from sanitary officials and other authorities.

Ed Nash at East Orange, New Jersey, where the supermarket test was carried out, said that sacks can eliminate refuse problems such as insanitary containers, and they can do much to reduce the fly problem. They can be an asset not only to the store, but the community around us.

Mr. Morse, Superintendent of Public Works, College Park, Maryland, said the entire system is cleaner for the collection crew and for the homeowner as well as for the city.

Thank you very much.

MR. SHAYNE: Thank you, Mr. Taylor.

Our next speaker is Kenneth S. Watson of Louisville, Kentucky. He is now manager of the water management laboratory of the major appliance division of General Electric Company.

Prior to this assignment, he served for eleven years as consultant on water management and waste control for the General Electric Company. He is a graduate of the University of West Virginia with a Bachelor of Science degree in chemical engineering.

Later, he became the active secretary-engineer of the West Virginia Water Commission, and also served a year as assistant director of the Ohio River Valley Water Sanitation Commission.

Before coming to General Electric, he was a member of the Commission and chairman of the technical committee of the Interstate Commission on the Potomac River Basin. He was also a member from West Virginia of the Ohio River Valley Water Sanitation Commission.

He is a member of the Water Pollution Control Federation. During the 1957-1958 Federation year, he served as president of that organization.

Mr. Watson is a member of a number of professional organizations and the recipient of several awards for outstanding achievement in pollution control.

In 1956, he was designated by the Secretary of State to serve as engineer-advisor to the United States delegation to the World Health Assembly in Geneva. He has authored numerous papers on water management and waste treatment of which more than seventy-five have been published.

It is indeed a pleasure for me to introduce to you Mr. Kenneth S. Watson.

MR. WATSON: Mr. Chairman, gentlemen of the conference, my presentation today covers a newer method of coping with the city garbage problem, that of installing a food waste disposer in each home and combining the food waste problem with the sewage problem. This, of course, does not do anything for the rubbish problem except to make the refuse problem a little more sanitary in handling and perhaps extend the period of time between collections.

The General Electric Company has rather completely studied the relationship between the disposer and the sewer system, because the use of food waste disposers is rapidly growing, and coming up with all the facts in this area should permit this growth to take place on a sound and systematic basis and permit us to answer the many questions that are aimed at us.

The results of our surveys are thus available to all communities that want to make use of this information, without obligation. We have a number of technical reprints covering this survey work.

I would be very happy to send anyone copies of this information who might be interested in it, or supply you copies if you will see me and leave your business card with me today. Unfortunately, last night and this morning, I got some telephone calls about an emergency situation in Pittsburgh so I will have to leave and will not be able to sit in on this very fine conference for the remainder of it.

First, let us review the amount of water used by disposers and the cost of electricity to permit a disposer to be operated.

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Originally in Louisville, Kentucky, to obtain information to improve our design competence, we installed a timer and recorder adjacent to each disposer in our consignment homes in Louisville and recorded the minutes of operation per day and the number of cycles of operation.

Then, we got a little more sophisticated.

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We have gone to a better method of communicating this. We run a second telephone line into the home to the disposal location and telemeter the information to the laboratory at the Park, covering the number of minutes of operation and the number of cycles of operation per day.

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This shows a distribution curve covering the average minutes of operation of a disposer. This is based on twenty-six telemetering homes in Louisville. You will note there is an average operation of 2.18 minutes per day, and that 95 per cent of the homes use the disposer less than 3.64 minutes per day.

The dotted-in blocks that you see on this distribution curve is information from ten homes, using the old system, so that what this does is simply to make one system corroborate the other, and makes sure the data from both are good.

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This gets to the amount of water used. The heavy line there is the maximum discharge of a faucet in a sink where the disposer is being used, with an aerator in use. The dotted line is the normal flow that the housewife said she set the faucet at when she used the disposer on the recommended calibration. The dotted line is maximum flow without an aerator. We feel the maximum discharge with the aerator is the most significant curve on there because most homes with a disposer will have an aerator in use, and with the aerator in use, the faucet can be turned on fully without excessive splashing, and this is more nearly the representative setting. The maximum discharge without the aerator is not recommended because the housewife won't put up with that much splash.

This is a normal judgment setting, and we were calibrating the figures.

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From this information, we can come up with the water usage in gallons every day, and the reason these figures go from 6.3 to 9.3 is that we added in fifty per cent additional water because we instruct the homeowner to let the water flow after the disposer is shut off to clear the line. This is from twenty-three hundred to twenty-five hundred gallons per year, a cost in Louisville, Kentucky, of sixty-nine cents to $1.02 annually.

A disposer requires about 12 kilowatt hours per year of electric current on this operating basis. This is a cost of about 25 cents per year, and this requires considerably less electric current than a clock because a clock operates continuously.

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Next, let's take a look at the practices in the country. There are some 70 communities in the United States that have ordinances requiring the use of food waste disposers primarily in new construction. We won't have time to cover all of those.

Columbus, Ohio, is one of those, by the way, but what I would like to do next is to go to the three communities making the wide use of disposers in the United States.

The first of these is Detroit, Michigan. There we have a total of seventeen communities in the Greater Detroit area, a population of only two million, 1960 basis, covered by these ordinances, requiring the use of disposers, and in some cases, they have the alternate option of an on-site incinerator in new construction.

I might point out that there are three communities in the Greater Detroit area that had deadlines in those ordinances by which date all homes had to be equipped with disposers. Those deadlines have all come up and passed. These are the Grosse Point communities. These three are now one hundred per cent equipped with disposers.

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This shows the primary sewage treatment plant that takes the waste water from Detroit. In the Detroit area, there are over 150,000 food waste disposers connected in this system. This treatment plant does a satisfactory treatment job and discharges the wastes into a small stream.

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This shows the next community, the Los Angeles, California, area. In that we have sixteen communities covering a population of 746,919 people, taken from the 1960 census. It is interesting to note that the city proper does not have an ordinance requiring the use of disposers. I might point out that Los Angeles does not permit the use of incinerators in lieu of disposers for obvious reasons.

In the Los Angeles city proper, without an ordinance, over 55 per cent of the homes are equipped with food waste disposers, and that is a total of seven million plus complex in the Los Angeles area also, over 55 per cent of the people are using food waste disposers.

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This is the Hypernion sewage treatment plant in Los Angeles that does take these sanitary sewage plus the waste load from the disposers, treats it and discharges the effluent to the sea.

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This shows the situation in the Denver, Colorado, area. There are five communities with ordinances which require the installation of disposers. The first one went into effect July 6, 1952.

I might point out that two of the communities there have deadlines by which all homes must be equipped with disposers. The first of these, Thornton has been passed, January 1, 1963, and as of that time there were some articles in the technical literature that community statistics indicated that 99.6 per cent of the people served have food waste disposers.

Another interesting angle on this area, you will notice the Aurora and Westminster have provision for forgiving the homeowners with disposers from having to pay the service collection of garbage costs. There they do separately collect the garbage.

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This is the sewage treatment plant that is treating the waste water from Aurora, Colorado. This is a very fine plant. It has a very complete laboratory, a complete treatment plant, discharges the waste load from the sanitary sewage and the disposers in use in some 65 per cent of the residences equipped with disposers into a small stream.

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Next I would like to consider a little bit what we found out in exploring these three areas. In Aurora, an average waste water discharge per person was 50 gallons per capita per day. This is explainable because there is only about twelve inches of rainfall there. The sanitary system is completely separated from the storm. There is no storm water in the sanitary system. There is no industry connected into the city sewer system. This is the reason why this figure looks kind of small.

Los Angeles, the average there was about 100 gallons per capita per day. The rainfall in the Los Angeles area is also small. This is highly industrialized section. There is a water conservation program carried out by industry.

In Detroit, Michigan, the figure is 225 gallons per capita per day. Considerable rainfall, of course, is in the Detroit area, and combined sewer system and of course, high industrialized area. It does indicate that, depending upon the particular circumstances, these figures do vary widely.

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This is the control laboratory at Aurora sewage treatment plant. I show this because the analytical information which I am going to cover later was all run in this laboratory by Aurora city personnel.

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This is a summary of the operating results over a five-year period that we dug out of the very fine record kept by Aurora. You will note there that there is some slight increase in BOD and suspended solids. I mentioned earlier there is no industry connected to this system.

This being the case, we took a very careful look at the operating cost per million gallons and the maintenance cost of the sewer system, feeling that because in the lowest year, some 250 new food waste disposers were installed. In the peak year during this period, 1962, disposers were installed in most of the homes in this area. The only change of any magnitude that would take place in the quality of the waste water there should be as a result of the food waste disposer load, so since there is no increase in cost of the operation of the plant or maintenance of the system, this bears out the position taken by the personnel in the city of Aurora that food waste dispensers create no problems of consequence in the sewer system and sewage treatment plant.

We have completed this same kind of a summary for Detroit and Los Angeles, but will not cover it today because of lack of time. I might point out that there was even a slight decrease in concentration over this five-year period in both Los Angeles and Detroit. The reason for this, I think, is not that there wasn't a slight disposer load there, but there were other factors that were perhaps more significant. The use of more water, for instance, home laundries, dishwashers, and so forth, had an effect. The fact that the industrial and commercial waste being connected with the system were having to provide a higher degree of treatment, and those provided volume, but not concentration.

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When we finished this survey of five years, this study of the data that had been compiled out there, there was one item which created a little question for us and that was what was the contribution of the commercial disposers. We didn't know how many were in use at the beginning, during the period, or at the end, so, fortunately, right at that time, General Electric came out with a prototype of a portable disposer. This permitted us for the first time to take a subdivision of Aurora, Hoffman Heights, and consign into that subdivision enough portable disposers to make a test. This could be done because they didn't have to be plumbed in. We installed enough of these portable disposers to bring the percentage of usage from 65 per cent up to 88 per cent. Complete analyses of the waste water ahead of the two-month period, when the portable units were in use, and after this period, were run by the city to document conditions before and during the period when the 358 consigned units were also in operation.

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This is a shot of the recorder that was installed at the pump station in which all of the waste water from Hoffman Heights is pumped into Aurora. This permitted us to measure the volume of waste water coming from Hoffman Heights and take accurate composite samples.

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This shows that disposers do contribute a load. The upper line shows the BOD concentration during the morning period, and the lower line shows the BOD concentration without the portable disposers in use, indicating that during the period that the portables were in use, there was a higher BOD concentration.

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This shows the same evening peak. These were the two periods of the day in which you could detect this increase in load. This, again, shows the BOD and we have run this on suspended solids and some other determinations that will only take time, but we will only take time to show this, and use the BOD comparison data shown here.

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This shows the relationship between the Hoffman Heights discharge and the city discharge, indicating that Hoffman Heights was not a big factor in the total city discharge, but a big enough factor to be significant.

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What this permitted us to do was to determine how many pounds more BOD and suspended solids were being discharged into the city sewer system during the period of time that these 358 portable disposers were in use. We knew exactly how many people were using these disposers, 1552, so by division, we could compute the exact load contributed by an individual using a disposer over and above the load that he normally contributed in his sanitary sewage.

In the case of BOD, this amounts to .052 pounds per capita. In the case of suspended solids, it is .064 pounds per capita.

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If we look at the classic design figures, both of these figures are in about the 30 per cent range, so that is what this says, a community goes 100 per cent food waste disposers, it means a 30 per cent increase in BOD and suspended solid load. Along with this work in Louisville, there is an indication that there is about a two per cent increase in the hydraulic load that goes along with this.

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What this provides is a test for the first time on a large enough sample so that any sanitary engineer, or consulting engineer, can design a sewer system and a sewage treatment plant to take in the percentage of disposers that would be considered for the future. Obviously, if only 50 per cent disposers are going to be used at any future time, it would mean only a 15 per cent increase in BOD and suspended solids.

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This is a shot of the sewage treatment plant at Jasper, Indiana, and as most of you will remember, Jasper was the first community to use this concept, beginning back in 1951, and today some 80 plus per cent of all residences in Jasper are equipped with food waste disposers.

In the interest of time, gentlemen, that is all I will have to say at the moment. I will be happy to attempt to answer any questions that you might have. As I said before, this survey information is available without obligation to anyone that wants it, so if you want to write to me, I will be glad to supply it to you.

Thank you.

MR. ROBINSON: Gentlemen, our time is almost up. I think in fairness, we should allow some time for questions. If we run after school hours, that will be all right, won't it?

FROM THE FLOOR: My question is to Mr. Watson. Recently there have been a number of articles in pest control literature about the increase in the rat problem in cities that have been attributed to increased amounts of food waste that are added to sewers by these waste grinders. Has your study indicated any relation to this, or can you shed some light on this question?

MR. WATSON: I have had a number of those particular queries land on my desk about a particular community. I have, in every case, gotten in touch with this community to see if there was any justification for the particular claim. Thus far, I have not been able to find any substantiation for the claim. For instance, we know the high usage communities in the country.

Take Aurora, for instance, where over 70 per cent of the homes are using food waste disposers. They have no particularly difficult rat problems. All sewer systems have some rats.

My philosophy on the subject is that if you are going to go 100 per cent disposers, there will be more food waste in the sewer system and this might be inclined to attract more rats, or grow more rats, but, on the other hand, it takes those food wastes out of the garbage cans, and thus the rats are not attracted to the garbage cans, but to the sewer system. They are concentrated there, and a systematic program of poisoning there should be easier to handle than anyplace else. It should be easier to handle rats underground in the sewer system than would be the case above ground.

As I said before, on everyone of these cases -- I remember one was from Pendleton, Oregon, about additional rats in the sewer system there because of the use of food waste disposers. When I checked with Pendleton, they were not using a particularly high percentage of disposers and the City Manager wrote back and said they did not have any particular incidence of rats there, so I think these are just rumors that somebody has rationalized.

As far as I can find out, there is no real justification for it.

FROM THE FLOOR: Do you have any information regarding the reduction in collection costs of the function of adding the disposers? Is there any information to indicate that this has reduced the collection costs, the frequency, and so forth?

MR. WATSON: There has been a paper presented on the Aurora situation and it is ready for publication. It has not yet appeared.

Since over 70 per cent of the garbage is disposed of in this way, as I said before, garbage in Aurora is collected separately from the remainder of the refuse. Since 70 per cent of the garbage or food waste goes into the sewage system, then we could compare the cost of handling that quantity according to the 30 per cent surface collected. I will see if I can remember what the figures amounted to.

The cost was about 56 cents per capita for handling it in the sewer system and about $1.62 for the cost of surface collection, but now you see that you could only make this kind of a comparison where you do practice separate collection of garbage, because where the garbage is combined with the refuse, it is a very small percentage of the total, and the benefits that you would get by putting the garbage or the food waste into the sewerage system in this kind of a situation would be much more intangible, but you do get the benefits of the more sanitary refuse handling situation with the possibility of longer time periods between collections.

In other words, if a community was 100 per cent disposers, then possibly you could go to one collection a week of refuse rather than two collections a week to take care of the more putrescible insanitary garbage portion.

A direct comparison can be made and there is an article in for publication on this question when a community practices the separate collection of garbage, and putting it into the sewer system, but when you try to compare it to one where you have the combined collection, the advantages, cost-wise, are not as great.

FROM THE FLOOR: I would like to know how much you can justify or get to your taxpayer where you are using two very, very short commodities, water, for one thing, and sewer systems, for another. I think most of you men here are of the same opinion I am, that we are overloaded on sewers, short on water, and still need another disposal system. We are using three units in place of one.

Most cities are very short on sewage plants, as most of you know, and they are building as fast as they can. Water is a commodity that is very short.

How can we go to the taxpayer and ask for more water, more sewage treatment plants, and still ask for incineration, landfill, or something in that way, composting, and come up with a good answer to the taxpayer?

MR. ROBINSON: That is a real good one for you.

MR. WATSON: That, of course, is a $64,000 question. Obviously, as we go down into the future, we are going to have to solve the waste water problem, and we are going to have to solve the solid waste problem, and I think without question today that the solid waste problem is the more serious of the two.

Then, you bring up the water problem. I don't get nearly as disturbed about the water situation as some of the scare propagandists would have us be frightened. I don't think we have as much water shortage as is indicated, but what we are guilty of doing is not doing a good management job with the resources we have. Obviously, we have to cope with all of these. One of the problems, I think, is that you have the solid waste problem handled by one branch of the city government, and you have the liquid waste problem handled by another branch of the city government, and one doesn't have enough liaison with the other, or doesn't care particularly whether, in total interest of the city, these are handled in the simplest and most economic manner; because there is a relationship between the solid waste problem and the water problem and the air problem.

Air is one commodity you didn't bring up. This is another one. This is between the liquid problem, the air problem, and the solid waste problem. What we need to do is solve all four of them in the very most economical manner possible, and I think it is going to take a good bit of study, one of these bearing on the other, to decide how to solve all of them in the cheapest and most economical manner.

FROM THE FLOOR: My question is directed to Mr. Watson, again. It is in the same vein, generally, as the previous question. First, however, I want to compliment you, Mr. Watson, on the fine work you did in gathering the data for this.

My question is this: If you are going to compare these figures economically, what have you gathered in the way of increased cost at the treatment plant to bring about a satisfactory solution of the sewage problem? Have you any comparison figures on these things on the same basis?

In other words, you showed us no data on the effluent of the plant. What happened to the BOD and suspended solids of the effluent? You showed us an increase of approximately 30 per cent BOD and suspended solids in the influent, attributable to the home disposal unit. If we are to say it isn't costing us any more, we have to compare the things on the same basis. The effluent would have to be the same at the end. What is the answer there?

MR. WATSON: There was no deterioration in the effluent quality. You don't get something for nothing in this field anyplace. That is where I came up with the figures of 56 cents compared to about $1.60. This was based on the cost of handling BOD and suspended solids down at the sewage treatment plant, so I think one of the things that comes into this picture, and one of the reasons why General Electric has gotten into this as deeply as we have, there is no question but what the homemaker, the lady of the house of the nation, is going to demand more and more the use of food waste disposals from the standpoint of convenience, better home sanitation. There is no question about that in my mind.

This means that this is another challenge that the sewage treatment field is going to have to face up to. Our work indicates that the waste load contributed by food waste disposers is completely compatible with the wastes already present in the sewer system.

It is completely susceptible to treatment by conventional sanitary sewage treatment facilities, so if a community wants to make use of food waste disposers en mass, there is no question but what the sewage treatment facilities and the treatment plant can be provided to do this.

Further, because sewage treatment facilities are primarily volume oriented in design, and because you have got to have a basic sewage treatment facility for your city, anyway, with a big, huge investment in it, the incremental increase required to treat additional BOD and suspended solids is not very great compared to the total investment.

Now, to say that this is without question the most economical way to go, this would take a tremendous amount of investigation, the interplay of the garbage problem against the sewage problem, against the air pollution problem, and all of the rest of it, and this has not been thoroughly and completely done as far as I am concerned, but what I am saying -- and I think I have been in the public health and sanitary field long enough that I am impartial, even though I work in the General Electric Company, what I am saying, looking at our sales figures and those of our competitors on food waste disposers, they are here, and they are here to stay. They do not create a very severe problem.

You put some more solids in. If you have got a section of line that is substandard and you are having to flush it now and you put disposers in, you are going to have to flush it more. If you have a plant that is up to capacity, you had better not go the 100 per cent route. You had better modernize your sewage treatment facilities, and at that time, if the community wants to make use of food waste disposers, design in them the necessary capacity to carry the extra load.

I am not up here preaching a strong sermon that food waste disposers is the only way to go. It is one way to go. The problem is serious. It looks to me like all applicable methods are going to have to be exploited to the maximum to cope with it.

What I am trying to do is to say this is one way we are trying to gather enough information to make it possible for the communities to use this method to the greatest extent that they might want to.

FROM THE FLOOR: Mr. Watson, you seem to be the favorite target.

In your slide, you showed a cost per year in Louisville of 69 cents to $1.02 per year added because of disposal. What is the average water bill in Louisville? That might give us a clue as to what percentage of flow we can expect out of disposers with reference to sewage treatment plants.

MR. WATSON: I wouldn't swear that I could quote the correct figure, but it is around $60 to $80 a year.

FROM THE FLOOR: Less than two per cent flow contributed by the disposer?

MR. WATSON: Water is a little more expensive in Louisville than in some places.

MR. ROBINSON: Mr. Shayne, Mr. Watson, Mr. Taylor, I want to thank you for telling us what on-site disposal is. Mr. Shayne has indicated if there are additional questions, they will be glad to answer them during the break which we will now have.

We are ten minutes late, but we will take fifteen minutes and remember to be punctual.

TECHNIQUES OF COLLECTION

PANEL

MESSRS: R. C. TAYLOR, CRANE, DR. LYNN

This section will be a panel similar to the type just finished. It will last a little longer. It is on the TECHNIQUES OF COLLECTION. I will introduce the chairman of the panel, and he will introduce the other members of the panel.

The Chairman is Dr. Walter R. Lynn, Associate Professor of Engineering, Cornell University.

DR. LYNN: Thank you, Robbie.

Gentlemen, the procedure that the panel will follow this afternoon is to break the three speakers' talks into portions. Mr. Taylor, who I will introduce to you in a moment, will speak on the general techniques of solid waste collection. Then Mr. Crane will speak to you also about the techniques, but will relate this to a specific California study, and I will attempt to follow these two gentlemen with some discussion about research in the area of solid waste collection.

Thus, to begin the panel's discussion, I would like to introduce to you Mr. Ralph C. Taylor, Superintendent of Waste Collection, Department of Public Works, Cincinnati, Ohio.

Mr. Taylor is, of course, a professional engineer, graduated from the University of Cincinnati as a civil engineer. He is also a recipient of a certificate in public administration from that same institution.

He served the city of Cincinnati as assistant superintendent and superintendent of public works since 1930, ascending to the latter position in 1938.

He is a member of the American Public Works Association, serving that organization on the Committee on Solid Waste, and is also President of the Street Maintenance and Sanitation Officials of Ohio.

... Mr. Taylor presented his prepared paper ...

TECHNIQUES OF COLLECTION

By Ralph C. Taylor,
Superintendent of Waste Collection,
Cincinnati, Ohio

The refuse collection methods used by communities differ rather widely because of varying local conditions and requirements.

To determine the best method or combination of methods to be used to assure a complete economical, sanitary collection, the following factors must be considered. These have been segregated into two groups -- those which are fixed by policy or existing conditions, and those wherein the administrators can exercise discretion. Under the grouping of fixed policy or existing conditions, the following factors are listed:

1. Type of refuse produced
2. Responsibility for disposal
3. Disposal methods
4. Population density
5. Physical layout of area
6. Zoning
7. Climate

Factors open to determination are:

1. Extent to which municipal, contract, and/or private methods are to be used
2. Materials to be handled
3. Type of equipment available or selected
4. Location of refuse for collection
5. Organization of crews

Based on a knowledge of the above factors, we can proceed with how to accomplish the work. Two basic methods have been developed, which, with many possible combinations, provide a wide range of practice. These include:

1) Definite task assignment for individual crews
    a. Daily route method
    b. Large route method

        c. Single load method
        d. Definite working day - irregular frequency method

2) Integration of the work of several crews
    a. Swing crew method
    b. Variable size crew method
    c. Inter-route relay method
    d. Reservoir route method

One of the most common and perhaps the simplest distribution of the work is to divide the community into areas which provide as nearly as possible one day's work for one crew. This plan is usually called the daily route control method. If three collections a week are made, a crew will have two areas from which to collect; if twice-a-week collection is provided, each crew will have three areas; if collection is weekly, each crew will have five or six areas. A definite number of stops are made in each area, and normally, a day's work is considered complete when the task of collecting from the area is finished. The advantages of this plan are that the householders can know definitely on which day or days the collection will be made.

Another method frequently used for assignment of work is called the large route control method and provides for the assignment of larger areas or routes to individual collection crews. The customary practice is to lay out enough work for a normal week's activity for a single crew. A crew begins a route on Monday without any rigidly fixed stopping point for the day's work. Work begins the next day at the point reached the day before, and so on until the entire route is completed. The major stipulation is that each route must be entirely completed within the working week. Ordinarily, the crew is considered to have completed its week's work when the entire area or route has been finished. Since the properties to be served in a single day cannot be definitely known, this method is most satisfactory with set-out and set-back service or where collectors carry containers from the householders' premises to the collection vehicles.

A variation of the daily route method is a plan of laying out areas or routes which, under normal conditions, will each provide a full load of refuse. Usually each crew has two, three, or four such routes for a day's work, depending on the size of the crew, the capacity of the equipment, the length of haul, and other factors. As a rule, the routes assigned to a single crew are not continuous, but are selected with the idea of providing a full day's work. It is not unusual to have the first load or route located some distance from the disposal or transfer site, and subsequent loads much closer.

The main advantage of the single load plan is that during normal periods a full day's work is provided for both the crew and the equipment. A disadvantage is that the work of a single crew is not confined to a particular area, making it more difficult for the collectors to remember their routes.

Definite working day - irregular frequency method. Some communities faced with the necessity of limiting the working period to a definite number of hours because of higher rates for overtime, or because of other reasons, have adopted a method which sacrifices regularity of collections to gain uniformity in working hours. Essentially, this is a variation of the large route method. Definite routes are laid out and a length of time adopted for a working day. The next working day collections are resumed at the point reached during the previous period. This continues until the route is completely collected. The process then begins again immediately, often in the middle of a day, so that there is virtually no beginning or end to a route. The length of the route will determine the average frequency of collection, but this method is not generally used where more than one pick-up a week is necessary. The time required to complete a route will depend on the amount of refuse produced, on the weather, on the efficiency of the workmen and on other factors.

Relay method. The relay method, sometimes called the shuttle method, provides for the use of two or more vehicles for a single collection crew. Obviously, this arrangement is suitable only when the time required to load a vehicle is equal to or less than that consumed in traveling to and from the disposal point. This is often true when (1) the vehicles have relatively small capacities, (2) the loading crew is comparatively large, (3) a large amount of bulky refuse is collected in densely populated areas, and (4) the hauling distance is rather great. The ideal arrangement would be an equal balance between loading and hauling time, but this, of course, is impossible because of the varying hauling distance for different loads and the changing conditions of loading.

In an effort to overcome some the weaknesses which develop when crews work independently, several plans of coordinating the activities of two or more crews have been tried in some municipalities.

Swing Crew method. One of the simplest methods of compensating for unusually large amounts of refuse on certain days or at certain seasons is to provide one or more extra crews to help out at any point where they are needed. Such crews are frequently called swing crews in which case very close contact with the regular crews is necessary if the supervisors are to know where help will be required.

Variable size of crew method. Instead of varying the number of crews and the number of collection vehicles, one simple method of integrating the refuse collection work is to provide a variable number of collectors from the individual crews, depending on the amount and conditions of work on particular routes.

Inter-route relief method. Another method has been developed which provides for regular crews to help collect other routes when their own assignments are completed. When used with daily routes, the supervisory officers must keep in close touch with the progress on each route and be in a position to make additional assignments as the crews complete the regular routes.

Reservoir route method. Another important refuse collection method which integrates several crews is called the reservoir route method because the basic principle involves the establishment of a central overflow route amoung a group of several routes. Typically, three, four, or five routes are laid out around a center route and the entire group constitutes a working unit. Greater flexibility in operation is permitted within such a group because the central or reservoir route may be collected by all crews from the marginal routes after their regular route is completed. The work continues by all crews in the reservoir routes until all refuse is collected.

Each of the methods described is in actual use in American municipalities, sometimes in the simplest form, but in other places in combination with other methods. For any particular city, there may be more bad than good in some of the methods.

There are two fundamental criteria for the suitability of any method: (1) Does it accomplish effectively the work to be done? (2) Is it economical? Community standards of service, sanitation, and appearance enter into the evaluation of the character of the work done. The economy of the operations covers such matters as proper routing and scheduling, work incentives, and adequate supervision and administration.

To show how the community has handled the problem, I would like to discuss with you Cincinnati's solution, since I am more familiar with it.

Chapter 707 of the Cincinnati Code of Ordinances set up the framework within which the Division of Waste Collection, a part of the Department of Public Works, operates.

Under Section 1 - The following are defined Waste, Combustible Waste, Non-combustible Waste, Garbage, Ashes, Commercial Waste. Other sections cover container requirement, setting out containers, separation of waste, disposal of commercial waste, etc.

On June 1, 1931, the City of Cincinnati assumed the responsibility for the collection of all household wastes, as well as a limited quantity of commercial wastes, and arranged for their disposal. Two separations of Waste in Cincinnati are required for collection and disposal purposes; one, the combustible collection includes all waste substances capable of incineration, including wrapped garbage, paper, rags, excelsior, wood, grass, leaves, and the like; the second, the non-combustible collection, includes all waste substances incapable of burning, including tin cans, metallic substances, bottles, glassware, earthenware, ashes, and the like, and also discarded articles, the greater part of which is incapable of incineration, such as asphalt roofing material, electric batteries, etc.

The City does not collect commercial waste. Commercial garbage from hotels, hospitals, and restaurants may be collected by city crews, but such institutions prefer service from private collectors under special contract haulers licensed by the City. At the present time, we have seven licensed collectors who are taking care of the large hotels, most of the hospitals, and many of the restaurants in the downtown section.

Since the disposal of all combustible waste in Cincinnati is by incineration, the size limitations on this material as outlined in our Rules and Regulations was necessary so that the materials could be fed into the furnaces with a minimum of preparation by City forces. The limitations on quantity was deemed necessary to prevent the presentation for collection of truck load lots, and the hampering of regular service for the remainder of the City.

For the purposes of collection, the City is divided into three divisions, each under a supervisor. Each division is further sub-divided into districts with a foreman in charge. Working on a five-day week basis, each district is divided into five areas, each representing one day's work. All collections are on a once-a-week basis. The day's work for a district is laid out in crew routes, arranged so that the crews work toward a common meeting area. The foreman, therefore, has his entire force in a small area at the end of the day and can easily determine that the route has been collected. No crew leaves until the entire task is completed.

The relay method is used with variations, depending on the distance from the disposal point and the density of population. A typical crew consists of two trucks, two drivers, and three leaders, plus set-out men. The set-out men go to the rear of the house and bring the cans to the curb, from which the collection crews make the pick-up. The set-out service is rendered to all houses having five families or less. In other words, City employees carry out the full containers to the curb line from the rear house line of all residences, from single family to five dwellings. In the case of the larger apartment building, i.e., six families and more, the janitor or person in charge of the building must place the containers at the curb line for collection. While one truck is hauling refuse to the disposal site and returning to the route, the collection crew is loading the other truck. The empty truck returns; if the collecting vehicle is not fully loaded, the driver will take one man from the crew and make collections in dead-end streets and areas where larger crews would be inefficient, on the same route. In some areas, the balance between loading time and hauling time is not suitable for this arrangement, and other relay arrangements are made. Sometimes three trucks are supplied for two collection crews when the hauling distance is fairly short.

For servicing schools, large apartment buildings, hospitals, etc., a system of large container service is available. Two types of pick-up are used. One, the individual containers are picked up, carried to the disposal point, emptied and returned. The other, the containers are picked up and emptied into a large collection unit on the site, the unit emptying a number of containers before traveling to the disposal point.

We have, in the short time available, merely introduced the subject. Because of the importance of the solid waste problem, it warrants the most intensive study, the best analysis, the use of every available modern technique, and all coupled with the very best efforts of everyone involved.

DR. LYNN: The second speaker is Mr. Larry Crane who is currently with the Robert A. Taft Sanitary Engineering Center in Cincinnati as a solid waste consultant. He is a graduate of Iowa State University in civil engineering in 1962, a member of the American Public Works Association. From January, 1963, through September, 1964, he was a sanitary engineer in solid waste engineering with the Public Health Service in Washington.

Since September of 1964, he has been a solid waste consultant in the solid waste training at the Taft Sanitary Engineering Center in Cincinnati.

He has written a number of publications in the solid waste field dealing with economic questions and the like, and he will nowaddress you on the collection problem.

... Mr. Crane presented his prepared paper ...

REFUSE COLLECTION

By Larry E. Crane,
Senior Assistant Sanitary Engineer,
Division of Environmental Engineering
and Food Protection, Public Health Service,
Department of Health, Education, and
Welfare, Cincinnati,Ohio

Even a casual review of recent literature reveals that an overwhelming majority of the articles written on solid wastes are on the subject of disposal. The most recent Public Health Service Bibliography[1] contained 338 articles on solid waste disposal while there were only 108, or less than one-third on collection. Research follows along the same line with disposal receiving the majority of the effort.

From a Public Health viewpoint this may not be too surprising. However, from an economic point the cost of collection far exceeds that of disposal. Collection costs are approximately 80-90 per cent of the total cost for refuse service. The collection operation is usually less efficient for most communities and is the first area to consider when trying to improve and economize a refuse program.

RESIDENTIAL REFUSE COLLECTION

There are three basic methods of residential refuse collection:

1. Curb or alley
2. Backyard
3. Variations of these involving set-out or set-back by the householder.

From an economic standpoint the first one is the most desirable to the collection agency, since the increased labor for complete backyard service is approximately 60 per cent. A study by the University of California[2] indicated that the pickup time for curb or alley collection is approximately 100 man-minutes of labor per ton collected, while complete backyard service requires 160 man-minute per ton. The system where the householder sets the full container at the curb or returns the empty container after collection has a labor requirement somewhere between the other two types.

From the householder's viewpoint, the backyard service is more convenient and aesthetic. As a personal opinion, I would not like to have my container sitting at the curb all night for collection the next morning, with the container being retrieved that evening. I believe that most people would feel this way if they had a choice of systems. Usually the collection agency will provide the best service that their budget will allow.

In communities where the new refuse paper sacks have been put into service, the increase in cost for complete backyard service over curb service is not so great since the collector needs to make only one trip to the backyard. College Park and Riverdale, Maryland, reported substantial savings with backyard collection of paper sacks, over the previously used backyard collection service. The system has had a very high acceptance by the citizens. This has the same advantages of the skip or tote system for backyard collection without the littering and spillage that sometimes occur during the transfer operation.

COLLECTION EQUIPMENT

The equipment used for residential collection varies from small open trucks to some of the new large compactor trucks. The compactor trucks have reduced the number trips which are required to the disposal site. The size and type of truck which is most desirable for a community will vary somewhat depending on the local conditions. There is nothing more useless than a large compactor truck which makes two trips a day to the disposal site and is less than half filled on the last trip. Adequate estimates of the quantity of refuse to be collected can be made before the size of the truck is selected.

The open truck is still required for the collection of the bulky items, such as brush and large furniture. Presently designed compactor trucks cannot handle all of this material.

A recent addition to the collection equipment line, is the train system. In this system a small vehicle such as pickup truck, jeep, or heavy duty station wagon, is used to pull a series of three or more two-wheel trailers. The body of the trailers is similar to the bulk containers. A large compactor truck or "mother truck" is used to transport the material from the trailers to the disposal site. The truck may meet them at a pre-arranged location or be radio controlled. This system is designed for large communities which have several collection routes and functions best in an area with relatively flat terrain and a mild climate. It appears that a savings in man-power would be realized since the collection crew is able to work continuously with no interruption for trips to the disposal area.

COLLECTION CREW

The size of the collection crew should be decided for each individual community and in some cases for each collection route. However, common sense would indicate that many of our communities have crews which are entirely too large. The study by the University of California[2] indicated that a three-man crew for packer trucks would probably be the most economic based on man-minutes per ton of refuse picked up.

COMMERCIAL AND INDUSTRIAL COLLECTIONS

Commercial and industrial collections are rapidly changing to the detachable container systems. There are three basic types:

1. Pick up and empty by the collection vehicle
2. Lift and carry to the disposal site
3. Stationary packers

There is an economic advantage of these systems over having a row of refuse containers which are necessary to hold the accumulations. If the system is well maintained, there is also an aesthetic advantage. Cleaning of the detachable containers may present a problem. The best method of cleaning is with steam which usually requires removing the containers to a central cleaning point.

TRANSFER STATIONS

Transfer stations are becoming an integral part of the refuse collection operation in some areas, particularly California. The principle of the operation is to transfer the refuse from the smaller collection vehicles into large bulk haulers for the trip to the disposal site. The transfer vehicle may be a truck-trailer combination or possibly a railroad car for extremely long hauls.

The refuse may be dumped directly into the larger vehicle and transported to the disposal site or there may be some special handling, such as storage of peak loads and re-handling for loading. A compaction mechanism could be used to provide the most efficient load in the transfer vehicles. Compaction for large highway vehicles should be carefully checked to insure that gross weight limitations will not be exceeded.

The experience in Los Angeles County[3] has shown that the cost of operating a 120 ton per day transfer station was $2.68 per ton. With this added to the cost of the sanitary landfill operation, the cost was $3.68 per ton. The transfer station enables them to utilize a sanitary landfill site which requires a 45 mile round trip haul for this cost. The cost for the entire operation is still less than municipal incineration.

PUBLIC HEALTH ASPECTS

The accumulations of refuse in our homes, industries, and commercial areas must be regularly collected and transported to sanitary disposal sites to protect our health. If not handled adequately, refuse produces many hazards to our health:

1. Rodents find food and harborage in piles of refuse.
2. Flies and other insects are attracted to exposed refuse for food and breeding media.
3. Many accidents occur each year from improper storage and collection of refuse, including:
   a. Children playing in or near refuse areas.
   b. Fires from neglected refuse areas.
   c. Occupational hazards for collectors.[4]

Several studies[5 & 6] on the migration of fly larvae have pointed out the inadequacy of once-a-week collection of garbage, or combined refuse, in warm climates or during the summer months. The only adequate method to reduce the migration of fly larvae from refuse containers, is twice-a-week collection. One study in particular found that there was no significant difference in the number of fly larvae that migrated from containers with tight fitting lids and ones without lids. This does not mean lids are not necessary, however. The lids still protect against rodents and spillage from wind.

A study which was just completed in Santa Clara County, California, compared fly production from five basic types of storage containers with once and twice-a-week collection. The data for the study was presented by Mr. Dean Ecke at the American Public Works Association Congress and Equipment Show in Los Angeles, California, last month. The container types were:

1. Metal cans
2. Metal cans with vapona strips
3. Supported paper sacks
4. Enclosed paper sacks
5. Exposed paper sacks

The following table presents the data which Mr. Ecke presented.

Migration of Fly Larvae

Type of Container	Once/week		Twice/week	
	Average	Median	Average	Median
Cans	6408	2292	610	21
Cans-Vapona	886	89	295*	4*
Supported Sacks	4192	849	537*	50*
Enclosed Sacks	984	182	191*	0*
Exposed Sacks	491	87	145*	0*

*Estimated by doubling first half week collection

These figures again point out the necessity of more than once-a-week collection of refuse to reduce the production of flies from refuse containers.

Although refuse collectors are among the lowest paid occupation, they have one of the highest occupational injury rates. In the early 1950's, New York City sanitation men[4] had an injury rate of 69.2 per million man-hours worked compared to 12.1 for manufacturing employees. In addition, they are exposed to such occupational diseases as arthritis, hernia, and diseases of the heart, back muscles, and skin.

COLLECTION AGENCIES

The responsibility for refuse collection is left to the individual unless it is accepted by the municipality or local jurisdiction. In many parts of Europe the municipality must accept the responsibility for refuse collection. Unfortunately too many cities in this country have not accepted this responsibility. By accepting the responsibility the community does not actually have to conduct the collection operation, but it should have rigid control over the collection agency. There are three different types of collection agencies which can be utilized:

1. Public
2. Contract
3. Private or scavenger

In a recent survey by APWA[7], several communities were utilizing all three types of agencies.

The public agency has some advantages by having sanitation and not profit as the motive for refuse collection, providing a flexible type of service, being directly responsible to the public, having no motive to cut service and expend as little of the allocated budget as possible, and generally providing the least expensive service because no profit is necessary and they are not taxed. The disadvantages must be considered also. These include adverse political influence which may sacrifice business principles and the possibility of operation of the agency by officials who have not had any training or are not conscientious.

Advantages to the municipality of having contract collection, are the application of business principles, elimination of policies, simplification of the work for the municipality, definite cost established in advance, and the contractor must raise the necessary capital. The disadvantages include profit, not sanitation, as the primary motive; less flexibility in service because of contract; no alternative service if a contract is breached; uncertainty on the part of the contractor as to the renewal of his contract; difficulty encountered in letting a long-term contract, and additional expense for some cities in using this service.

The private collector or scavenger is the least acceptable of the three types. The collectors are either licensed or have a franchise. In almost all cases, this type of arrangement results in expensive overlapping of routes, and competition for customers, which results in price-cutting and a lowering of sanitation and service.

SUMMARY

Many of our cities are paying for refuse service out of general taxes. Often they have reached maximum millage and sufficient budget is not available. Refuse service may be far down on the list of agencies to receive appropriations and they are unable to conduct adequate services. Even though refuse services are the third largest municipal expenditure in the U.S., it is obvious that not enough is being spent to provide adequate services for a large portion of our population.

We have reached a point where the collection of refuse must be looked upon as a public utility and the citizens must be prepared to pay for this service. People are willing to pay for telephone, electric, gas, water, and bus service. They should also be willing to pay a reasonable fee for proper refuse collection.

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DR. LYNN: Gentlemen, it is my intention to tell you something about some of the research, certainly not all of the research, that is going on in the solid waste collection field.

To echo Mr. Crane's comment, solid waste collection occupies anywhere from 75 to 90 per cent of the total cost of solid waste collection and disposal.

The collection aspect figures range, depending on where the sites are located, from 75 per cent up to 90 per cent.

I must admit that I will have to digress here. The words "mother compactive" really touched me.

Those of you who play around with computers are frequently chastised, as I know I am, for giving human characteristics to a machine. It is common for people who are dealing with the human aspects of computer machines to fall into the trap of saying, "You just tell the machine to do so and so and it then makes the decision, et cetera, et cetera."

Of course, the machine doesn't know the values, but you tell the machine and it decides. That is really computer jargon to associate more humanistic values to a collection of transistors, tubes, and wires than it possibly should have, because there is communication between humans and machines.

When you used the term "mother compactors" I recognized that you were getting close to the use of the humanistic terms.

The words "mother compactor" are quite appropriate.

In order to get into this question, let me try to categorize the collection problem as an area of research. It falls into a general class of research problem which is characteristic of problems in what is called systems analysis, or systems engineering, or operations research. What this is, is anytime you have a limited amount of resources, and this type of case, we do have a limited amount of resources, with alternative ways of using the resources, there is considerable pressure in our economy, in fact, in all economies, to try to make maximum use of these resources. Such problems occur in water resource development. They also occur in terms of industrial potential, and this is no different problem from the problem in the solid waste collection field. This, too, is an industrial activity maintained under a municipal label.

The fact is that the resources are limited and what are these limited resources? One of them, obviously, is cash. We do not have unlimited amounts of funds to spend for solid waste problems, so this is, in itself, a limited resource.

We have a number of alternatives available to us in terms of collection practices, and this also applies to disposal practices as well. There are various alternatives. The question arises which one is the best, and there are a variety of traditional methods to try to arrive at the best one. These are basically trial and error procedures.

The hope is that one can evolve a procedure that will be a little bit better than trial and error and will provide insight and information about a massive system such as a collection system which is unique in the industrial complex, providing insights that could not be obtained by trial and error, and perhaps utilizing rapid computation facilities, like machines, to give us answers which would take an inordinate amount of time to get by field sampling.

In the area of research, there are two classes of research that are certainly needed. One has been given more attention than the other, and that is the data-gathering aspects, and yet the information that has been gathered is insufficient, and, again, to echo Mr. Rogus' continuing comment about standardization of information, this is certainly a great lack, and especially the consulting engineer, who at sometime or another has to make a decision about a new community where he is going to extrapolate from an existing community and has to tread that dangerous land between a community that is not at a particular site with which he is concerned.

The problem in terms of data collection are real and very difficult. They are of great significance in this area of systems analysis because the results one gets from examining these systems are really not better than the input data which are available for examination.

Part of the reason for this data problem, apart from the nonstandardization of data gathering, is that usually there are not facilities available for proper data gathering at the site. This has been somewhat rectified in the waste disposal field, liquid waste, with a general standardization of laboratory reporting procedures which have problems similar to this, but the situation is getting better. In the solid waste field, I am sure the situation is getting better.

To tell you something about systems analysis very quickly, what we look at very generally is what are called general problems and these are problems in which there are tremendous interdependencies. To explain what I mean here, let's take a look at the whole business of waste disposal - solid waste disposal. There are many aspects of the problem, the type of disposal, the collection routes, the frequency of collection, the scheduling, et cetera.

Obviously there is no solution to the solid waste problem until one looks at all these factors.

Further, let me call -- to change the name somewhat -- call this the solid waste complex problem and compare it with the school bus problem. The school bus problem has been worked on as has the traveling salesman problem. That is not an entree for a dirty joke, or even the beginning of a dirty joke, but is an analagous situation to the school bus problem.

Here I have a central school district or some school district. I have pupils dispersed through this area. I will send a vehicle with a known load capacity through the area picking up students at various points. The students have an advantage over the solid waste in that they are somewhat ambulatory and can move, but the problem is still quite similar.

The next question is when shall I pick up the pupils and how shall I distribute them. The students do not have a finite amount of time. You can't pick up the children at anytime during the hour and put them on the bus, for example, at five o'clock in the evening, but you must have them all at the school at approximately eight o'clock in the morning and, of course, you have later to pick them up and redistribute them.

The traveling salesman's problem is one of the older problems in this area, but it has been solved. The traveling salesman's problem does have great similarity. His problem runs something like this: I will tell you how it was couched initially. At one time, there were 48 state capitols, excluding consideration of Hawaii and Alaska since it is hard to get there by car. The problem was that a salesman had to call at each one of the state capitols, and there were a large number of available routes to go from any one capitol to the next. The question was: Give him a start at a particular city and how shall he route himself so that he visits each state capitol and does this without repeating? That is, he goes to no state capitol twice, and does this so that he travels the minimum distance. If you don't think that is an important problem, you should try it.

I am sure there are not many traveling salesmen who consider that an important problem, but theoretically, it is an interesting problem because it is a problem in the classification of networks.

There was some concern which put on a contest to see, during the period this problem existed, whether there was any way that the mathematicians could solve this. A soap company took on a little puzzle. I don't know whether any of you ever saw this or not, but one of the soap companies had a map of the United States and they picked out the first three routes, I think Boston, Washington, D.C., New York City, and Boston, and they asked you to write down in sequence the cities that would be next visited, and if you had the best solution, you won something like $10,000 for coming up with the right answer. This was an attempt partly to see whether somebody could come up with a correct solution.

I am not sure which approach they intended to use, but I think they expected to go to the fellow who won it and see if he could go back and state how he did it.

The problem has now been essentially solved.

I am sure I haven't really contributed anything to you, to your information about systems analysis in detail. I might try to show you a couple of slides. I am not sure that they will make things clearer to you or not, but basically the attempt is to mathematically write a statement of the problem of collection.

This is not really too difficult to do. The question is: Can we be explicit, that is, can we write down in equation form essentially how it is that the system operates? If we can do this, then we call this a mathematical model of the system, and one can then operate on this mathematical model with the idea of obtaining a specific result.

In order to do this, one has to look at what are called criteria for optimization - Optimization being best, and what are the criteria for optimization? They are many.

When we talk about criteria for optimization, we are talking about a value system. If one asks: What is it that you would like to maximize in terms of a collection system, one could think of a variety of things. You could say, "Well, I would like to collect this material in the least possible time."

Well, that is already a minimization problem. The question is, then, to get the minimum, you must minimize the time of collecting wastes, subject to all the constraints; that is, subject to the rules that we have to use when we make collections from all the people in the system.

Another problem might be to minimize the cost of the system. On this criterion, the effort might be to maximize the frequency of collection between specific budget constraints; that is, you are constrained not to spend any more than N number of dollars.

Well, let's try a slide and see whether this works. I am not sure that it will.

... Slide ...

The purpose is here. If each of the numbered cells represented, for example, points of collection, a consumer, if you started at node number one, there are obviously a large number of ways that I could collect from each one of these people, jumping around through the network and getting to the last one and out of the system, if I allowed myself to have ingress and egress from any point of the system. This is called a network, and there is a lot of research that goes on from the mathematician's point of view in the network, and in nice, simple, linear cost models, or linear functional models, there are available solutions.

The problem, mathematically, in the solid waste collection field is that it is massive. If you have 100,000 stops to make, there obviously have to be 100,000 of these little nodes, and even with large, high speed computers, this gets to be quite a task.

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This is just to show you what is, again, a little bit about systems analysis.

This is really very simple when you get onto the idea. That is a part of the cost function, and it is a variable X. X can be anything, and for our purposes at the moment, let us say it is garbage or solid waste to be treated by some process, and if there are a large number of these processes, say five, and the cost function is separable, it means we can add up each one of the separate C's, we get a total which is the sum of C-1, C-2, C-3, C-4, all in terms of the functional equation. All this is writing the same thing four different ways.

All right, now, to give you some idea of what is meant by constraint, actually this model is a representation of a treatment process. This is a disposal method constraint, and -- incidentally, the complete description of this paper is given in the 1963 meeting of the National Conference on Solid Waste Research which is published by the APWA. I get no royalties, but there are an interesting collection of papers in there that should be called to your attention, presumably giving the most recent collection of papers in the solid waste research field.

That is what is meant by a constraint. If you look at that statement, it says V is less than equal to the sum of X-1, X-2, X-3, X-4, and X-5. Let's give these explicit definitions. Let's call X-1 the volume, if you will, of solid wastes to be treated by incineration.

X-2 is the volume to be treated by sanitary landfill.

X-3 is to be treated by dumping at sea, although that is not done anymore, we are told.

X-4 amd X-5 indicate treatment by two other methods.

What is meant by a constraint is that whatever the solution to this problem would be that would minimize the cost, we would have to take care of a total volume of waste that is available. That is what that equation says.

The amount treated by the five processes must be at least as great as the total volume that will be made available to the system for treatment, and no solution that violates this constraint -- that is, if the sum of these X's is ever less than the total volume, this is what is called an unfeasible or illegal solution.

The second one is what I will call a site constraint, and if this is the total, that could be in terms of a variety of sanitary landfills. The equation should show Rho -1, X Rho, plus 2. The Rho's are just fractions, and they represent that fraction of the total volume which has to have ultimate disposal.

For example, if you have incineration, you have a reduction in volume. That volume has to be taken care of at some disposal site.

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This is commonly what is called the response surface. What we mean by a response surface is this: This is a response surface in two variables, and if you look at the scale that goes from left to right, it is a three-dimensional plot, hopefully. The X axis running from left to right is the quantity of variable X. The axis running presumably backward is a second variable Y and the cost which is come function of X and Y produces that shell which is called the response surface.

Presumably if I had an equation which would say that cost equals X-1, X squared plus Y squared, I would get that, but I would get points on this response surface which are marked with little c's there, the responses.

The only point to this is to say that here we have a three-dimensional plot in which two of the dimensions are variables which can be controlled and the job is to find the minimum point. This can be done by selecting the appropriate variables. This problem is easily solved by calculus. However, when you get into what is called in dimensional space 1, 2, 3, out to the Nth one, you can't picture this response surface anymore, so one has to go to computer technology to examine such surfaces.

I want to talk to you about a specific research project which occurred in the area of simulation. If I can tell you something about simulation very quickly, it is the following: Frequently problems such as the solid waste field are not easily structured in a mathematical form. That is, they are too complex, have too many variables, they exceed in many cases computer capacity for examination, but this is a short-lived situation.

The time is coming when computers will look at problems. There are some companies which are already doing this. There will come a time when computers will look at problems where the numbers of variables will run into millions, and the numbers of constraints -- that is the numbers of rules by which the system must operate -- will run into the hundreds of thousands. It is not only conceptual now, but it is practical to examine large numbers of variable problems to perhaps get some answers analytically on the question of solid waste collection and other environmental problems.

In order to simulate a system, what I need to do is to be able to describe simply how the system operates. I think I have a succinct statement here. In many cases, it is difficult to describe a system mathematically, and frequently some of these problems, even if you describe them, have no solution analytically.

Analysis in the systems' jargon is a procedure involving the use of digital or analog computers, or both, in which an operating model of the system is developed which simply reproduces the behavior of the system every time.

I am going to show you a flow chart of such a simulation system. It is possible to construct such a model when the overall behavior of the system cannot be described, and if the following conditions can be satisfied.

One, the system can be separated into elements which are sufficiently well understood and can be described in detail, and I will make this point in a second.

Two, that the operating rules for the system be established for each element, and the interaction of each pair of elements can be described.

A model of an entire system can be built from these established relationships and an input into any element passes through the entire system by following the operating rules which apply to each element, and the rules for its movement to the next element.

The use of simulation in conjunction with computers enables one to experiment with models of complex situations and examine their behavior over time. The advantage of the computer here is that it compresses real time into small increments of machine time with the result that you can examine years of experience of operation of this model, usually in hours or fractions of an hour.

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If I can call your attention to this slide, this is a flow chart for a simulation model that was being carried on by Abe Charens at Northwestern, and Jimmy Iquan, and the idea of this model is to simulate -- and this was built for Wilmet, Illinois, I think.

The first variable that we wanted to consider here was the effect of weather. They had a little box that said, "Generate the weather variety."

How did they do this? They have no thunder storm generator, and moisture is not desirable. What is done is this: One can examine what we will call stochastic elements in the environment. A stochastic element is a variable that is an element that varies over time in a probabilistic way. I can have the history of weather in any quarter, and I can tell you what the probability is of a rain, not on any particular day, but what the probability is of having rain during that quarter.

Well, if I know the frequency distribution of rainfall, let's say, or snowfall, of low temperature, any one of the weather factors that seems to affect solid waste collections procedures, I can then generate a probability distribution of these factors and simply ask the machine to pick out the weather for a given day.

What it does, it generates a random number, picks a number out of a hat or a black bag, and says it is number four. When it picks out the number four which has the probability of -- the picking out of a four is the same as the picking out of the number of any day, or the weather on a particular day, and it tells you what the weather is. Again, we are not interested in that one day, but we are going to ask it to go through and pick that weather severity maybe a hundred thousand times. The hope is that when it picks out enough of these, the weather situation that we will examine will have the same statistics as the weather situation that you can expect for that community.

Given that weather severity, it then calculates with a particular way of calculation which is given in the machine, it computes the travel time to arrive at the first contributor unit in the area, and it leaves the garbage at that point.

We will follow that vehicle through. It arrives at the first contributor, in effect, for the first time. Then, we have another stochastic element. How much waste will be picked up from that unit? Well, the procedure is to go into the field and get some estimate of what the distribution is, the probability of having finite or certain quantities of solid waste contributed on any particular day. This requires generating these statistics. The model then goes ahead and picks a number out of the bag which is somewhere in the realm of possibility in this test, and it picks out a particular time.

It does the same thing for that given volume, the amount, and determines the collection rate since there is correspondence between the volume and the collection rate. Then, we change this by the weather severity factor. If the weather is bad, it is going to affect the time required to collect this amount of garbage.

Then the model does the following: It calculates the amount of time to put as much of that refuse as fits on the truck and puts it on, if it can get it on. Otherwise -- well, let's go through with the interrogation. It calculates the time, then it asks the following question: Is the truck full?

This is simply a number which has been generated by everything that has been collected in the past. If it is empty the first time, the answer will be no, unless the volume at that station is greater than the truck capacity.

If the answer is no, the program goes through and picks the next distributor and goes into this loop. Until that truck fills up -- and that is enough numbers are generated to fill up the truck, the question comes up: Is the truck full? Then, the answer is yes.

It then goes into the following interrogation: It says, "Was the last person who filled up the truck, or whose part load filled up the truck -- were you finished with picking up that load? Did you have enough capacity to take on that volume"?

The answer is no. Then, a switch is made so that when the truck is empty, it is going to go back and find that person that it just left. If the answer is yes, the time is calculated to go to the dump. The truck then arrives at the dump. The question is asked about loading and unloading, et cetera.

Well, if you address your attention to this, you can see that what this is is an attempt to simulate the real world. It is done by taking discrete steps and examining the steps one at a time, and what you get from this, the computer output is no solution in terms of what is the best thing, but it says, "Given a certain distribution of input, weather, et cetera, what is the distribution of times to collect for all these areas"?

You can then play with different routing procedures by, for example, giving the machine a specific routing pattern and asking it to examine the collection from each of these units until it finally -- until you have examined them all - generated the statistics for these, and this gives you, then, some insight into what the possible solution is for a particular community.

What is required for this are data that are not frequently available, that is, data on weather and so forth which is easy. The question of time to collect from individual units and the like is very difficult to get, however, the fact that we are not using specific numbers but a distribution of numbers, that is, that there is some probability of taking five minutes to collect and also of taking thirty-five minutes to collect, we have specific information about the random nature of the whole process.

Keep in mind that nothing in this waste collection field is ever going to be -- one is never going to be able to say something with 100 per cent probability, or a probability of 100 per cent assurance. The reason is that this is a classic open system problem. You have no control over the input. The input comes to you as it will. You can't control it. There is nothing that you can do to make the householder change or alter how much particular garbage she is going to generate in one day, or how much refuse. You can constrain her to break this habit, or that habit, but no rules are going to confine her operation in any substantial way.

Well, to summarize, the Northwestern people have finished this simulation and they are preparing a report which will go to the Division of Environmental Engineering and Food Protection who will see it first and it will be generally made available for the field.

What I have tried to do is give you some idea of what the procedures are here and what the general approach is in terms of general problems of systems analysis related to terms of this field.

Very few people are working in this area. I don't know why, but it certainly is a fruitful area for doing research.

I thank you for your patience.

The procedure that we would like to follow now, we have about thirty minutes more, we would like to open the meeting for general discussion and general questions.

FROM THE FLOOR: I gather some figures have been written for a computer for simulation. When will that come to us?

DR. LYNN: Yes. It will be made available. I do not know when.

FROM THE FLOOR: What language does it use, and where can a copy be obtained?

DR. LYNN: It was written for the control data 3600, and it is convertible. You can write to A. E. Charnes, Technological

Institute, Northwestern University, Evanston, Illinois.

There is another paper which has been published by Mr. James Baker.

He has written a paper which was published in Public Works in November, 1963. The title of the paper is called "Finding the Lowest Cost for Refuse Disposal," and this is a computer solution also, given the following conditions: If you have disposal sites available and you want to find -- well, two things. Number one, which site should you use? This is a sanitary landfill site, primarily. It is a large area in Maryland that he examined, a sizeable area.

The idea of making this a regional facility rather than an individual community facility, how do you go about scheduling the use of the particular landfills in terms of where each community will dump its waste?

This is a computer program by exhaustion. It is called an enumeration procedure, but it works. It is not the most efficient use of the computer, but it will give a solution that is rather useful, and I think you can write him directly. I am sure you can get a reprint from Public Works. That is the November, 1963, issue. If you want the rest of his address, there is a larger paper called The Cooperative Municipal Refuse Disposal Program for Prince George County, Maryland, of which I have a copy.

FROM THE FLOOR: My question is directed to Mr. Taylor. Can you tell me whether you limit the size or the number of containers per unit family?

MR. TAYLOR: Yes, we use the standard No. 2 container. Big, 55-gallon drums are not collected.

As far as household waste goes, there is no limit for household waste, per se. Yard cleanings, two containers per collection.

No construction waste of any kind is collected. That must be handled by the individual or the contractor who does the work.

We have limits on the size of brush. It must be bundled, securely tied, two feet in diameter, four feet long. Yard cleanings, two cans per collection.

FROM THE FLOOR: I would like to ask this: I frankly don't understand all of this, but if Mr. Taylor wanted to make use of what you said, Dr. Lynn, what would he do? If he wanted to put this in use in Cincinnati, for example, what would he do? Would he go out and hire someone, or is this just something in the future? What is the application of this?

DR. LYNN: I will answer this first, and probably you will have a response, too, Mr. Taylor.

This is a problem. Let me say, first of all, that the intent of work done in this area is not theoretical. As a matter of fact, the work done in operational research is intended to be quite practical.

If one wanted to be completely theoretical, you don't have to bother with the real world. I don't know whether I got to you the idea of constraints. These constraints are to make sure that the solution is meeting the practical requirements of the real world.

One of the difficulties with structuring these things is to ask yourself the question: How are we really constrained? Frequently one makes decisions in advance of when they have to be made, mainly because you are limited to the number of calculations you can do. You use engineering judgment, and you say, "That is no good. The following things are no good, but there are some things that may be all right."

What one would like to do with having high speed computering facility is to reduce the number down so that you open the possible space, if you will, to answers that can be obtained.

In terms of the practical application, this will come very quickly. Some technical problems will have to be worked out. This simulation program will be written up for general use in communities.

What has got to be done is to translate perhaps more sophisticated language in systems analysis to more of an engineering terminology so that people don't have to worry about the inner workings of the computer and how to write the program. That program will be written. What they have to know is how to communicate with the computer. What sort of input information do we need? You may say, "Go out and measure the distribution time of each collection from the user." Or you may say, "Get some information about the weather and state what this will be." You might go further and say, "Get some information about the travel time from each unit to the disposal site."

Now, given this information which should be available to Mr. Taylor -- it is probably not immediately available because it is not necessarily the way he would look at the problem, but he can do this and you can plunge this in the machine and the output should be in a form -- he will know in advance what the nature of the output will be, and he can read this and say, "Well, that is an interesting solution, but what if it doesn't work that way"?

All right, that is a good question. What if the input data were not correct? Then, he can push the input data around a little. He can change the probability distribution in the sense of expanding it. Instead of the range being from five to twenty-five minutes to collect, say he arbitrarily makes the decision that may not be right, it may be between five and thirty-five minutes. What happens to the collection at this point? Instead of going out into the field and doing this in the space of minutes, he can get another result which would give him a different consequence, none of which, you know, is precise; but it enables him to make better judgments.

This is my opinion, leastwise. He can make better judgments about what his operation should be and how it should be carried on to help improve his situation.

Now that I have been evasive, specifically, I am afraid we are not at the stage to give this information directly to the user, but I would say within the next year or so this is going to begin to happen. That is the answer.

Mr. Taylor, do you want to comment on that?

MR. TAYLOR: No, I think the analogy is the same. If one of us had asked the Wright brothers whether you could mechanically determine how to fly an airplane knowing what they knew then, they would say no; but all of us followed the Gemini program very carefully and that has gotten to the point where two men have so many things to do that they can't do it. Maybe this won't apply to an individual village, but as I see it, the time is coming very shortly, is probably here, and probably was five years ago when the solid waste program should be approached on a regional basis. It is no longer John Jones anymore than it is any one community. It is up to the individual householders. It has to be a community effort. As I see it, it is becoming very quickly a regional problem and will need all the implementation we can give it with computers or other mechanical means to augment the solution, and get the answer quickly, because, as it is today, by the time you find a solution, your original premise is ten years old. We need the answer now and not ten years from today, so I think I would be most interested in seeing this really worked out and I think that each of us can analyze his own community problem.

We can learn to put that down on paper so that not only he, but other people, and most importantly the machine, knows what he wants to know. That is the point. We must know what we want to know. In order to find out something, you have to know what question to ask, so let's begin to work on that angle, and when it is available, let's try to be available ourselves to furnish information so this mechanization or electronification of waste collection and disposal can be accomplished.

MR. ROGUS: Addressing myself to this same point and in recognition of the fact that I am a great admirer of the data processing equipment, and we have been using data processing equipment for many years, and we have a very ambitious program for data processing for all solid waste disposal.

As I say, I am a great admirer of planning in this direction.

Unless you recognize that data processing has very definite limitations -- and we have to recognize that -- to illustrate, you can make a very complicated, sophisticated analysis and you say on the basis of this analysis, such and such a refuse collection operating in this area should make four pick-ups in a given eight-hour day. Then, that is standard for control. That is what management says.

Organized labor says, in effect, "Nuts to that. You are going to take up two truckloads a day in this particular area."

How do you put that variable in the machine?

DR. LYNN: That is easy.

MR. ROGUS: Or do you make a very sophisticated analysis on data programming where you can say you should put this incinerator in Times Square.

The subject of my comment is that I am with you 100 per cent on data processing, but you must be very careful and cautious and communicate with the practical people because there are a lot of variables in there that cannot be solved on the machine.

DR. LYNN: I have no argument with you, sir. I never did say that -- if you will recall -- that such techniques would give you the solution. What we are really looking for are aids to what are called decisions. These are called decision models. They are aids to decision making. In these problems, solid waste collection and disposal, water pollution control, there are too many intangibles, too many problems that cannot be explicitly stated, and, consequently, somebody has to make decisions about these.

Our concern is that the decision-maker, whether it be you or the city of New York, or whether it be the mayor or whoever does this, can quickly have available to him responses to inquiries of this model.

The question of what would happen if, for example, taking the case you use, what would happen if we came up with four pick-ups and the union says only two? One can explicitly write this into a model, that no more than two pick-ups can be done in any particular week. This increases the cost, obviously, and once this factor is known and what it does to the system, that is another piece of information. It doesn't tell you what you should do. It does give you some insight into what the consequences are of particular actions.

If I may digress for just one minute, I would like to give you an illustration of a model which we have finished. It happens to be in the water pollution field. The question has been asked -- well, you are given the facts that you have a sequence of waste treatment plants along a stream. The economist cites what are called external effects, that is, that any waste treatment producer -- let me explain that. Any person who contributes a sewage effluent really doesn't care from that community's point of view as to what happens downstream. There are no effects as far as he is concerned as long as his water intake is above that. The guy downstream has to worry about his problem.

Well, we presumably have become enlightened and we are now talking about the regional use of watersheds and one of the ways to get at this is to examine the watershed as a firm. We have asked this question and have constructed a very interesting model that gives us a great deal of insight.

The model is as follows: Given any number of waste treatment users along a stream, how should you allocate the amount of treatment to be given by each user that minimizes the cost of treatment for the whole stream, given the following: That you want to maintain certain levels of dissolved oxygen in that stream and certain levels of BOD in that stream. This is an effluent restraint and a stream restraint simultaneously.

We examined the Walada River out west which happens to be a nice, long river and could give us some insight, and we found that the legislation that would be required -- the model says in the year 1970, every user will be required to give 85 per cent removal in order to maintain certain dissolved oxygen standards on that stream.

By the use of this model, we have been able to determine that everybody treating at the same level costs more and doesn't better the water quality of the stream in terms of dissolved oxygen standards.

The question is, "All right, is it still better to have everybody give 85 per cent treatment"?

That is true, but that costs something. What we would like to know is what is this marginal cost between what you are required to have to meet the requirements that you have stipulated, so that you go into a more ambitious program with your eyes open.

This particular problem we are now doing with the State of New York for their -- New York has a lot of rivers -- New York State Board of Health is beginning to examine this with the idea of giving another tool to the State Health Department in terms of evaluating the treatment requirements to be stipulated for discharges of waste into that stream.

It is not going to settle the policy, but we call it a policy model because the fellow who is interrogating this model can simply ask the following questions: What if I raise the BOD level to 4.5? How much more will it cost? What if I raise it to 5, what will it cost?

The program is an obedient slave and it changes the amount of treatment to be given by each treatment plant because it is looking for the minimum cost point. The answer might be it would cost this much for all conditions, all coefficients, and so forth.

Excuse me, there are such models that can be used to aid people who are in the business of making decisions about what the level should be. Don't forget that somebody makes these decisions.

Harry Truman said, you know, "The buck stops here."

This happens in the solid waste field.

It has to figure out who made the decision, but ultimately somebody said, "This is what we are going to do." There is this person who is a decision-maker. Sometimes it is a group, but frequently it is one person.

FROM THE FLOOR: I have no question, but a comment. Mr. Crane brought up the idea of the question as to what the optimum number of men in the crew would be, whether five, four, or even one.

At College Park after we instituted the experiment with the paper sacks, we tried it with a one-man crew. I know that sounds funny, but what they did, they took an old mail truck and painted it with the colors of the town and put the man in it and sent him out on a route. He went in and got the paper containers. He then went and dumped it, much as the milkman would empty milk bottles. They found the cost of collection was reduced by approximately 50 per cent by using a one-man crew.

MR. CRANE: The only problem I would see on this, I have seen some of the one-man trucks that they have at APWA, too. It would be something like Cass came up with awhile ago as far as the union question was concerned. You are working this one poor guy pretty tough. They don't like this too well, working hard, and also cutting down on the size of the crews, so this would be the main obstacle to this; but I am sure this is true, particularly with paper sacks.

FROM THE FLOOR: I have a question for Mr. Crane.

In a community where you have considerable competition between private collectors or scavengers, do you find the level of service is satisfactory to the householder?

MR. CRANE: I think that the answer to that one would be a pretty definite no, that the householder is not getting good service. All this competition, they begin cutting price so that they can get more customers, and when they cut the price, they have got to cut the service.

MR. ROBINSON: Dr. Lynn, Ralph Taylor, Larry Crane, we certainly appreciate your efforts today.

I am glad most of them are smarter than I am because I think a lot of this went over my head.

We stand adjourned for the day.

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TUESDAY MORNING SESSION

DISPOSAL METHODS

The Tuesday morning session of the Seminar convened on September 21, 1965, at 8:00 A.M., L. E. Crane, Chairman, presiding.

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MR. CRANE: Our speaker of the morning, Mr. R. W. Eldredge is the solid waste consultant of the Public Health Service, Region V, in Chicago, Illinois. He received his Bachelor's Degree in civil engineering from the University of Illinois. He has had a number of years of engineering experience in the highway planning, construction, as well as municipal engineering, and as public works directors.

For the last two years he has been our solid waste consultant in Chicago, Region V, which covers Ohio also.

With that, I give you Mr. Eldredge to speak on open dumps.

... Mr. Eldredge presented his prepared paper ...

OPEN DUMPS

By Richard W. Eldredge,
Solid Waste Consultant,
U. S. P. H. S., Region V,
Chicago, Illinois

I suppose that many of you will believe the topic, Open Dumps, refers to the most archaic method of refuse disposal and one that has fallen into disuse in this enlightened age. Let me assure you that you are only half right. That is, open dumps are archaic. But they are by far the most prevalent method of solid waste disposal in use today. I am going to assume that you all are aware of the historical evolution of the open dump. That is, from the time the first man threw an apple core on the ground to the present date, the only improvement has been the placement of the materials in a more or less concentrated area.

The operation of an open dump to serve a large community is not a simple problem. Construction equipment similar to that which may be used on a sanitary landfill must be employed to continually "doze" down the dumped piles of refuse in order to make room for the subsequent unloading. Obviously, the expenditure of any funds for the equipment or maintenance of such equipment will require that some sort of revenue be obtained. It is quite customary to use other departmental funds to support the equipment to maintain the dump, and therefore, many balance sheets show an entirely cost-free operation.

Let me suggest that if you are called in to evaluate an open dump, you should create a realistic balance sheet; one that accounts for the time of the street department, the street department equipment, the sanitary department, the sanitary department equipment, rodent control, insect control, and includes the time of the personnel responsible for answering the phone calls, pursuant to the problems at the dump site. I do not wish to indicate that this problem is restricted to the large community that still maintains open dumps. It is also the problem of the small community for an open dump in any location poses a similar problem as a potential public health nuisance and entails similar expenditures of time and equipment with expenditures and problems usually proportional to the amount of refuse received.

An open dump is a typical example of refuse disposal by consideration of the "where" rather than the "how." Obviously, it doesn't matter how you do it in an open dump as long as it is well away from my house.

Aesthetics, water pollution problems, air pollution problems, and host of other considerations, have combined to make refuse disposal a serious community problem of particular importance to engineers and planners.

Rapidly advancing sanitary standards and increased knowledge of the relation of environmental factors to public health have helped to modify criteria for acceptability until primitive disposal methods are no longer defensible on a basis of low cost alone.

I am sure that you are all aware of the national program to reduce air and water pollution. I would like to furnish you with a brief outline of a case of each, water and air pollution, by an open dump, I am sure that many of you will be able to relate additional cases from your own personal experience.

In Los Angeles, California, during August 1958, a large rise in hardness was observed in water from a well adjacent to a refuse dump. The available data on the changes of chemical quality of this water were assembled by the Los Angeles Regional Board. Later, the Regional Board contracted with the California Department of Water Resources for an investigation of ground water impairment in the basin. The results showed a build-up of carbon dioxide apparently of refuse origin with an associated increase of hardness. This report, as developed by the California Department of Water Resources, entitled, "Effects of Refuse Dumps on Ground Water Quality" delineates the principle processes involved in the introduction of undesirable substances to the ground water through the agency of refuse dumps. The principal methods were listed as follows: Infiltration and percolation, refuse decomposition, gas production and movement, leaching, and ground water travel.

Refuse contains mineral and organic substances in quantities capable of seriously damaging underground water supplies. The organic matter of refuse will undergo aerobic and anaerobic biological decomposition and produce large volumes of carbon dioxide and methane gas. Carbon dioxide can seriously degrade ground water by dissolving calcium, magnesium, iron, and other substances which are undesirable at high concentrations. At present, it is not possible to estimate reliably the rate at which carbon dioxide will be produced in buried refuse and basic research is indicated to obtain quantitative information. Further studies have been made in the California area to determine the method of transmission of this pollution to the ground water table. Some methods of preventing this water pollution have been suggested. Let it suffice to say that most methods of preventing this pollution preclude the use of an open dump.

During the period 1960 to 1962, a series of investigations were carried out by Tulane University under contract with Public Health Service to determine the source and nature of air contaminants which produce asthma in New Orleans, Louisiana. Daily admissions to Charity Hospital emergency clinic for treatment of asthma range from 3 to 200 during the period 1953 to 1960. A number of air pollutants were collected and analyzed and their prevalence was compared with the prevalence of asthma outbreaks. A statistically significant relationship was found between the daily asthma admissions to Charity Hospital emergency clinic and the prevalence of one air pollutant, a poor combustion particle with associated silica. No relationship was shown between the concentrations of other pollutants and a number of reported asthma attacks. All possible sources of this particle were not examined. However, samples taken at one dump in the summer of 1961 revealed large quantities of this particle. An attempt is now being made to discontinue the subterranean burning of the dumps in the areas so that a comparison could be made from the current seasonal asthma rate.

Now obviously I have very quickly referred to water and air pollution as potential problems from open dumps feeling that other facets of this particular course will deal more thoroughly with documented cases of water and air pollution.

Since no other method of waste disposal as listed in the agenda for this course presents such a gigantic challenge in vector control as would an open dump, I will attempt to furnish you with some data and information which may help you establish the necessity for better refuse control through curtailment of disease vectors in the area.

A true vector-borne disease is one in which man is the vertebrate host and an arthropod such as a mosquito, fly, or tick, is the invertebrate vector. We also must consider the sum of all sources of infection or natural habitat of the parasite as a reservoir of the potential infection.

The host-parasite and host-vector relationship is a complex interplay of four primary factors, namely, reservoir, parasite (or causative agent of disease), vector, and host which result in disease, in apparent infection or immunity.

Basic epidemiological studies have shown that these four factors act together to determine the level of these vector-borne diseases. The PHS Publication, "Epidemiology and Control of Vector-Borne Diseases" indicates that levels of vector-borne diseases may be compared to a cost of living index based upon a particular year as shown here:

$$\text{Reservoir} \times \text{Parasite} \times \text{Vector} \times \text{Host} = \begin{array}{l}\text{Level of Disease for}\\ \text{a reference year}\end{array}$$

$$1 \times 1 \times 1 \times 1 = 1$$

Using basic mathematics the elimination of any one of the four factors reduces that factor to zero and therefore, reduces the level of disease to zero. As an example, vaccinations of all persons against yellow fever could create an immune population (the host), and the equation would become:

$$1 \times 1 \times 1 \times 0 = 0$$

In the days preceding yellow fever vaccinations the same effect was obtained by isolating carriers and contacts (the reservoir). Thus the equation becomes:

$$0 \times 1 \times 1 \times 1 = 0$$

Complete mosquito control of course would attack the vector factor, producing the following equation:

$$1 \times 1 \times 0 \times 1 = 0$$

It is understandable that the complete elimination of any one of these factors is extremely difficult. However, it can be shown that the partial reduction of any two of these factors act together to reduce the potential of vector-borne diseases. Thus, if isolation is accomplished for all but one-twentieth of the carriers and insecticides reduce the insect-vector population to one-tenth of the original quantity, then the level of disease is theoretically lowered according to the following formula:

$$1/20 \times 1 \times 1/10 \times 1 = 1/200 \text{ of the former level}$$

It is apparent that the reduction of food and harborage through the elimination of the open dump will reduce the factors representing vectors, reservoirs, and associated parasites, dependent upon the particular disease considered.

Thus, the reduction of food and harborage for rodents would effectively reduce the vectors for the transmission of Plague, Murine Typhus, Rickettsia pox, and Rat Bite Fever. A reduction in breeding locations for mosquitoes would decrease the vectors responsible for Eastern, Western and St. Louis Equine Encephalitis, Yellow Fever, Jungle Yellow Fever, and Dengue.

Flies and cockroaches and other insects act as vectors of transmission by mechanically transmitting typhoid, dysentery, and in some cases tularemia and anthrax. Using sanitary disposal methods to reduce these vectors, it is obvious from this equation that with the vector factor reduced, the disease potential is also reduced.

It is not my purpose to indicate that all dumps are infested with pandemic diseases; on the contrary, it is well known that combinations of conditions must be just right to cause pandemic or epidemic outbreaks in any area. The elimination of open dumps and the correction of poor refuse collection methods does not wholely eliminate the possibility of epidemics in the community. However, good refuse collection and disposal methods will greatly reduce the potential hazards of vector-borne diseases, and incidentally, satisfy esthetic requirements of both sight and smell among the discriminating.

It is natural for those wishing to convert an open dump to a more sanitary mode of operation to initially consider sanitary landfills. Let us consider some of the problems that may be involved with the conversion of an open dump to a sanitary landfill.

If there presently exists continuous or intermittent burning at the dump site, the conversion to a sanitary landfill will immediately eliminate this problem. A properly operated sanitary landfill allows no burning and the cellular construction of the fill aids in the rapid elimination of any fire that may occur.

Naturally, when we consider sanitary landfill, it is not adequately sanitary if its water pollution potential is not considered. In converting an open dump site to a sanitary landfill we must remember that the dump site itself with its open top and face absorb water and probably permitted more percolation of leachate than would be normal for a sanitary landfill at the same location because the earth coverage and compacted refuse cell would create a partial water barrier in most instances. It therefore becomes apparent that from the water and air pollution aspects, the conversion of an open dump to a sanitary landfill will make desirable improvements in the pollutional characteristics of the disposal site.

During the closure of an open dump, it is wise to give special consideration to the rodent population. In some cases, the closure of an open dump has caused a mass migration of rats to the nearby area in search of food and harborage. One who proposes a dump closure should consider the employment of an experienced pest control officer to eliminate the rodent-vector before closure. Warfarin and other slow acting rodenticides are not satisfactory for this purpose and highly potent Red Squill or 1080 should be applied only by an experienced pest control officer.

Although each dump closure has to be accomplished based on the individual site characteristics, here are some slides showing some recommended methods for converting open dumps to sanitary landfills that may be used at the smaller locations. The closure of an open dump is as much a part of a sanitary landfill conversion as the sanitary landfill itself and should be considered part of the total planning responsibility. Do not leave it to chance. The following slides are representative of dumps and unsanitary "sanitary" landfills and other modifications of refuse disposal procedures which are considered inadequate in their control of air and water pollution, or the suppression of disease vectors.

I have represented the majority of refuse disposal operations in use today. I sincerely hope that you will design, plan and use the minority report.

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MR. CRANE: Do we have any questions for Mr. Eldredge this morning?

FROM THE FLOOR: I want to add something to your water pollution discussion. About twenty-five years ago, I was chief engineer down in the southeastern corner of Indiana, or the southwestern corner of Ohio, which is a limestone strata formation. We had fifteen wells, and we were pumping thirteen million gallons of water a day from the ground. Suddenly, one of them turned up sour, polluted to high heaven.

We ran a test on all of the wells, running a test once every eight hours. We called in the water experts and started hunting. It took me three months, by sampling the wells, going in a gradual circle all around our area, and we found out we were getting our pollution in the Ohio-Indiana line dump which was eighteen miles away, but with the limestone strata, we were carrying it beautifully.

For one thing, don't think it has to be next door to you. You can be a considerable distance from a strata and still get pollution.

MR. ELDREDGE: You have some problems to be considered with sanitary landfills that should not be considered with an open dump. Nothing should be considered in an open dump.

You must consider the place you are putting in any type of disposal. They have fissured limestone as one of the biggest problems. It will travel a great distance untouched in such conditions. Under some of those conditions which we think are the worst, probably sandy soil such as they have in parts of Michigan, they probably have less problem than you do because they have enough filtration and separation through the sand to have reduced the problem, or the problem potential, anyway.

We will never say there is no problem because it depends on each and every site just exactly what its capabilities are.

I don't see Jim Hackett here this morning, but he is one of the men who is going to speak later on. He is from Illinois and is working on this problem, quite interested in it.

FROM THE FLOOR: Do you have any comparative costs for operating a landfill sanitarily versus a dump?

MR. ELDREDGE: Actually, the case that I showed you where a man changed from a dump to a sanitary landfill, they are doing that with extra money because they found that through the use of a dump operation, they did not keep things in the proper column in the budget, and they found out that the dump was operating at a loss. They are now trying to correct the disposal and put it on its own feet along with other utilities, but, really, from those that I have visited, and I have no documented figures -- I can't say it will cost so much this way and so much that way because each site has its particular problem; but in all the sites or in nearly all the sites that I have visited that have any operation equipment at all, with any know-how at all, with the same equipment they could have operated a sanitary landfill just the same. The only stipulation now on this is that there are some problems obtaining cover material in some sites, so with the same amount of equipment and maybe a modification in site, they would have been able to accept the job.

MR. CRANE: Thank you, Dick.

MR. CRANE: Our next subject, now that we know what not to do, we will get a little technique on the sanitary landfill method of disposal by Ralph Black, the chief of the solid waste engineering section, Public Health Service, Washington, D.C.

Ralph attended the College of the Pacific where he received a Bachelor's Degree in natural science, and Stanford University where he received his Master's Degree in civil engineering with a certificate in sanitary operation.

He was associated with the California State Department of Health and the Bureau of Vector Control for several years, has been with the Public Health Service as chief of the solid waste engineering section for five years. He was at one time editor of the California "Vector Views," a very excellent publication put out by the Bureau of Vector Control on Solid Waste.

He is presently secretary of the Solid Waste Committee of the American Public Works Association.

MR. BLACK: Thank you, Larry.

Good morning, gentlemen. I would like to go through a few short notes that I have here on sanitary landfilling and just generally cover this subject, and then show a few photographs that might better illustrate some of these things than I could hope to do verbally.

Present practices of sanitary landfilling are the result of an evolutionary process. Actually, the use of sanitary landfills dates back to 1916 in England where the process is still known as controlled tipping. The method was adapted to American conditions at New York City and Fresno, California, in the 1930's, but only a handful of communities experimented with the technique prior to World War II.

General Van Sands whom some of you know, directed Fresno's early sanitary landfill efforts and coined the term. They modified the method for use in the United States Army, and many of you who were in the army know how widely the army used this method.

These pioneering efforts not only provided an opportunity for many engineers and public works' officials to inspect these operations and evaluate the method, but also produced technical reports and articles which were the basis for continued refinement of the procedures used.

As was pointed out by the American Public Works Association Committee on Refuse Disposal which has already been alluded to several times yesterday, the successful use of the method by such cities as Fresno, New York, as well as the army, influenced the adoption of it in many municipalities.

By the end of 1945, almost a hundred cities in the United States had adopted it, and by the beginning of 1960, more than 1400 cities were reportedly using it.

The technological base for designing and operating sanitary landfills has been carefully reviewed by hard working committees of both the American Public Works Association and the American Society of Civil Engineers, resulting in publications such as the APWA's Municipal Refuse Disposal, and the ASCE's Sanitary Landfill, both of which provide a great deal of useful information which includes detailed references to the preceding experimental studies and particular procedures developed at many different operations.

One of the valuable contributions of ASCE's committee was the formulation of the following definition: "Sanitary landfill is a method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation, or at such more frequent intervals as may be necessary." I particularly emphasize the latter part of the definition, "or at such more frequent intervals as may be necessary."

The formulation of a definition of a sanitary landfill that is generally accepted has been most helpful in resolving inconsistencies in the technical literature. I think from some of the remarks that Dick Eldredge made, you will see some of the problems we face in this where we have some of these so-called sanitary landfill operations described and the costs quoted, and the unfavorable comparison is made that you face if you try to operate a landfill where your costs are too high.

Unfortunately, there has been considerable confusion on this nomenclature because of the tendency to label all landfill operations as sanitary landfills in the vain hope that such labeling by itself will insure public acceptance of the operation.

Actually, I believe that we ought to be thinking of four distinct methods of disposing of refuse on land: Open dumping, controlled burned dumping, refuse filling, and sanitary landfilling.

The costs which have been reported on these four are respectively 10 to 25 cents per ton, 25 to 50 cents per ton, 35 to 75 cents per ton, and 70 cents to $1.50 per ton.

The reason for the ranges here are the local cost of labor, local cost of land, and the economy scale in effect which is involved in the area.

We have heard in the preceding few minutes some of the details on open dumping so I won't dwell on that. In controlled burning dumping, which I don't believe is common in this area but is most prevalent in the southwestern states, refuse is unloaded onto a specially prepared dirt bank, usually about 12 feet high with a slope of approximately 40 degrees. The dump operator uses hand tools, ordinarily a hoe which is about three feet long to distribute any piles of refuse evenly on the banks, and he then sets fire to each load on the downwind edge.

Noticeably less smoke is produced and volume reduction is achieved to a mugh greater extent than when piles of refuse are dumped and burned. Tin cans and metal refuse are moved monthly with a crane equipped with a magnet. Efforts are made to remove tin and other metallic objects for shredding for shipment to copper mines. Although most of the controlled dumping is used in sparsely settled areas, some are to be found in metropolitan areas such as San Diego, California.

A good report of a controlled burning dump was serving a population of 80,000.

At refuse fills there is a systematic and periodic operation to compact and cover the refuse, but this is done on less than a daily basis. Operational techniques are the same as those used for sanitary landfills with the exception that the equipment is not used to cover the refuse each day.

I believe a careful distinction between these four methods of disposing of refuse on land is equally important from the standpoint of continued public support and the exchange of useful technical information.

If the landfill is not actually designed and operated in the manner that is acceptable to the public, no mere euphemism can be expected to be sufficient for irate citizens. When a disposal site is isolated, the use of this operating method is cheaper than sanitary landfilling and may be justified in the particular area. It may not be the best method in the long run, but at least we can explain the rationale of the use of such methods to the public and the operation is realistically labeled which will avoid some later difficulties.

This not only pays dividends in continued public acceptance and support, but it facilitates the exchange of useful technical information.

Following the publications which I previously cited, APWA's Refuse Method Disposal, and ASCE's Landfill Disposal, further articles have been published. In order to make it easier to review this material, the staff of the Division of Environmental Engineering and Food Protection has prepared annotated bibliographies.

I have one here which is dated 1960-1961. Many of you may have seen these.

In addition, a training guide and publication leaflet have been published, and a draft of recommended standards for sanitary landfill operation has been widely distributed for review and comment. These recommendations include standards and thirty-four items, together with a rating system which was developed as an aid to both public works and public health officials who must all share the responsibility for providing and maintaining adequate refuse disposal operations.

Experience has shown that successful sanitary landfill operations have one characteristic in common: Competent and continuing engineering planning and control. Research and investigations have been undertaken recently by several investigators to provide more specific information on the sanitary landfill process.

The relationships between refuse disposal operations and water pollution have been examined in England by the Technical Committee, and the experimental disposal of house refuse in wet and dry pits in Southern California, by the California State Water Control Board under contractual arrangements, to which Mr. Eldredge has already alluded.

The California project was undertaken to collaborate with and eventually present the matter of the effect of refuse dumps on ground water quality, the effects of physical and chemical phenomena on the rate of decomposition, as well as data on sanitary landfills which have been investigated by Professors Meyers and Stone in California in the vicinity of Los Angeles.

Professor Linsky, who is scheduled to be on the program later in this week, from the University of West Virginia, is currently conducting a bacteriological study of the sanitary landfill process.

It can be ascertained from this brief review that there is a great deal of useful information available in the technical literature on sanitary landfill operations.

However, it may be of more interest to examine specific examples of local applications of this method, and I have a few slides that we can go through, but let's finish the few comments that I have and come back to the examples later.

We have in the Los Angeles area three sanitary landfills operated by the Los Angeles County Sanitary District. They serve more than three million persons and fifty-seven cities and unincorporated areas, service areas, comprising approximately 650 square miles. Operations are conducted in a similar fashion at all of the three large sites.

Site No. 1 at Palos Verdes comprises 146 acres. Site No. 2 at Espadre, where Professors Meyers and Stone conducted their research work, is 192 acres. Site No. 3 at Mission Canyon is 385 acres. The method of operation at each of these sites is similar. Each of the lifts are 30 feet high, 4 feet thick, measured perpendicularly to the face of the rim which is maintained at about a five to one slope.

A 12-inch layer of dirt is compacted over the slope by the end of each day's operation. As I indicated earlier, this covering operation is proceeding all day long so that it is, in each case, completed before the equipment operators leave the job.

The user fees of one dollar per ton include the cost of land and site improvements which are twenty-three cents per ton for depreciation of equipment, forty-three cents per ton for operation and maintenance exclusive of equipment, and eleven cents per ton for billing and accounting. In these operations, the cover material is spread over the refuse and carefully compacted to form a tight seal or cover to perform several vital functions. This barrier prevents flies from laying eggs in the refuse, or rodents from invading the fill, and minimizes the blowing and scattering of refuse by the wind. It reduces the fire hazard and helps to promote a dense, stable fill. In addition, fly eggs and larvae which complete their development in the refuse are prevented from emerging as adult flies. Operations are planned in detail beforehand with the County Park Department. Final contours for specific uses, depth of cover necessary for landscaping, location of roads, the layout of building sites, provision for utilities and other features, are carefully reviewed before approval of the final plans so that when completed the sites will be ready for use as county operation regional parks. This use is required by county law in Los Angeles.

One of the important advantages of the sanitary landfill is that variations in character of the refuse or quantities received have little effect on the normal operations.

Such variations are easily handled with large crawler tractors, scrapers, and other earth moving equipment being used by many cities. Although these large machines are expensive, in many cases their higher capacity results in low unit cost of operation.

In summary, since cities are forced to dispose of sizeable portions of their refuse on land, regardless of whether incineration, composting, or some other volume reduction method is also utilized, some type of land disposal will continue to be widely practiced in this country. Since present sanitary landfill techniques can be used to conduct test operations without nuisance or public health hazard, this method will continue to be widely used, and I believe it will continue to be more commonly used as we go on.

... Slide ...

This is the Mission Canyon operation that I alluded to a few moments ago. If you look closely here, you will see that there are six D8 tractors. These machines cost $45,000 apiece. Also there are two TS-24 cubic yard carry-alls. The going rate on these is $95,000 apiece.

There is a water wagon that they use to settle the dust in this area. I have a better picture of this later on, but this water wagon costs about $75,000.

The capacity of this site and the use of it at the time these pictures were taken was 3500 tons per day.

... Slide ...

If you look closely at this slide, you can see that there are a variety of trucks unloading refuse here. Some of these are city trucks, some of them are private contractors' trucks, and some are

The trucks of private scavengers.

The portion of the fill to the extreme right has already been completed and the cover material is essentially taken from the surrounding side hills.

... Slide ...

This site, incidentally -- there is a better picture of the water wagon. I didn't list the grader, but there is a grader shown in this slide. In fact, quite a lot of equipment is shown here.

... Slide ...

The main purpose of the use of the water wagon here is to control the dust and the traffic coming and going here. With this type of equipment, they do the usual type of maintenance of the equipment that you commonly see on earth moving jobs.

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Here is a portion of the landfill which has been completed.

This is a matter of only a few days before they were operating in their neighboring canyon. This has been brought up to grade and they will no longer be putting additional refuse here. In this area, you can see the size of the houses.

... Slide ...

This is in the mountainous area, in Santa Monica mountains which come down between the San Fernando mountains and Los Angeles, a very desirable area for home sites. These houses are in the $40,000 to $50,000 range, right up against the landfill operation.

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You see the completed area behind these houses that are being constructed.

... Slide ...

This is the Palos Verdes operation. This is the entry way and the truck weighing station. As I mentioned, all the users of this site pay a fee on a tonnage basis and, again, the water wagon has been out and operating here to control dust.

... Slide ...

This is the fill itself. This is in an abandoned diatomaceous earth operation area, and they are busily converting this to a park. It is quite a large site.

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In this immediate area, those of you who know anything about the Palas Verdes area in Los Angeles will recognize, is again, a high-priced residential district where the lots are quite large, developed for the horsey set where the residents want to maintain two or three horses and they can get enough acreage for this purpose. It is zoned properly so they can do this. The housing is not the moderate priced housing.

... Slide ...

A municipal operation. This is the city of Burbank's operation looking from a downtown street in the city of Burbank, where you see the earth having been disturbed. This is a switch-back road with refuse buried on either side of the road as they go up.

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Here is the top looking down. This landfill started down at the street shown here, right by these houses, and it has worked up to the hill area.

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Here is the actual operation. Again you can see that they are using the water truck to control dust in the vicinity.

... Slide ...

This is a very rugged side hill. The reason that they hit on this method is that it provides them eventually with an access road to a large piece of city-owned ground up in this high canyon which is being developed as a city park.

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The actual refuse is buried off the right of way of the road.

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The road is finished as they go up. This is a private operation in an abandoned gravel pit in the Los Angeles area, showing that these are not all public operations.

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Here is another private operation in the Chicago area. The day was a bit rough for taking photographs. The picture is not as sharp as I would like to have it, but if you look closely, you can see where the drag line is working here, in this area where the refuse is being unloaded and compacted.

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The interesting thing about the layout of this operation of John Sexton's is that he has completely enclosed his operation by throwing up a berm around the whole site to screen the operation and also to get his cover material where he won't have to move it more than necessary.

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On the fill itself, they were using a Powell Special Compaction Equipment. Actually, they had two different types they were trying out at that time.

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This is in winter weather, and it had been raining quite hard in the last few days.

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Now, one of the things that I think all of you that are in the Chicago area or who have had an opportunity to get up there to look at that area is this construction. This shows in the upper righthand corner an 18-story building on one of these completed sanitary landfills. This structure is put on piling and this is another one of John Sexton's operations.

... Slide ...

This is the south Chicago area right on the freeway. Again, you see the snow. It is wintertime, and from the amount of water around here, you can see that there has been considerable rain.

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Here is a smaller operation being conducted by a national disposal company. Mr. John Vanderveld, who is going to be here later, will tell you about that. Those of you who have detailed questions on this can talk to him about it. The fill area is to the right, and shown in the foreground is filling which is going on in a marsh area.

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This is quite close to the neighbors, and a small operation that is well laid out and carefully operated.

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Now, we mentioned earlier that the problem of fly emergence at this sanitary landfill was something that had to be watched. These next two slides here are unfortunately not in color, but I think if you look at this area carefully, you will see that there is a peculiar looking fly here. This is a fly that has just emerged from the pupa case. The wings are not expanded. The head is the large part which is shown here. That balloon-like appearance of the head is caused by the tellinum which is a sort of a battering ram with which a fly is equipped and with which it can open up a passage through soil in order to escape from the ground.

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This picture shows, in the center near the bottom, the fly with the tellinum contracted. They work this plunger and their wedge-like feet, and follow up with this, and they then work the plunger again.

We did some work on this in trying to determine how much cover material is necessary to prevent flies from successfully making their way to the surface of the ground. Obviously, the amount of cover material that has to be put on sanitary landfill is of some importance to the day-to-day operator.

Starting with the generally used two-foot cover, we ran tests and found that up to five feet of cover materials, if it is just dumped on loose, was necessary. We had better than 90 per cent of the fli[illegible] successfully coming through five feet of loose fill.

After we got up to five feet, this ran off the scale, so to speak, from a practical standpoint, so we started using compacted cover testing and found, in testing this in the laboratory and at six different locations, that you can prevent this fly from emerging with only 2.5 inches of compacted cover material.

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This is on a laboratory basis. If you take it into the field, due to the crudities of using this large equipment, a six-inch layer of dirt was the depth of cover material that was found under field conditions to produce the desired results. This is the operation at the Oakland scavenger landfill at Oakland, California. This is a private contractor for the city of Oakland and about a dozen other cities in this area. This landfill was constructed originally by dyking an area of San Francisco bay, pumping out the water, and then operating it under conventional methods except that all the cover material has to be hauled in, and this is one of the trucks that brings in cover material.

... Slide ...

A smaller operation. This is at the small city of Lodi which is about fourteen miles to the north of Stockton - Stockton and Sacramento being over in the central valley of California. The difference in the local conditions here, I think, are pretty obvious. This heavy soil can be excavated and it will stand for a year or so at a time without any trouble. The city has taken advantage of this by using contract equipment once or twice a year, or once every other year to open up a large trench, stockpile the earth cover, and use their own equipment simply for compacting the refuse and covering it. They don't have to dig this heavy material with their small tractors.

... Slide ...

This operation is at the Monterey area, in California, again. The interesting thing here is that this is a combined operation. It is the Monterey garbage disposal district which includes the city of Seaside, as well as Monterey and Civic Grove, all this area as well as some unincorporated areas, too. This was the result of the city folks in this area getting together and figuring out a way to combine the operations so that they could get this economy of using large scale equipment, and have the area located where they could all use it and pro rate the cost among themselves.

... Slide ...

This is a private operator. This is in the San Jose area where we did some of the fly emergence work. The cover here was not placed carefully. There were many spots where the refuse was left uncovered, and as you might expect, the result was that they had no control over fly emergence whatsoever.

... Slide ...

This is a small operation, again, located near a small city. This is Watsonville, using a drag line. Here since the drag line was the only piece of equipment used, even though they were pretty generous with the use of the cover material, since it was not compacted, it did not do the job. You can see also that they are using only a drag line for placing the fill, and they have some problems in cutting the next trench close enough so that you don't waste dirt, but not close enough that you expose refuse that was previously buried there.

... Slide ...

Again, a small city operation going on under difficult soil conditions. This is Santa Cruz, operating in a canyon area.

... Slide ...

The next couple of slides that I have here show that there is no reason that these techniques cannot be used under severe winter conditions. Many of you know Leo Weaver, and the work that was done with Ed Booth and the cold weather operation of sanitary landfills. When this slide was taken it was 40 degrees below zero. The lowest point it got was 42 below, and daily operations were conducted here throughout that time.

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This requires heated cabs on the equipment, and laying out the job so that the cover material can be available throughout the cold weather period.

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This slide is a bit dark, but I have put it in here to show an example of the kind of sanitary landfill operations that are being conducted not only here but abroad. This is at Liverpool, England, the home of the Beatles, and this is on an estuary where it opens into the sea and they have a considerable surge of tides coming in. The only way that they can operate here to reclaim this area was to put up a very sizeable reinforced concrete wall and then pump out the water behind it and conduct their landfill.

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This section here is a portion of the completed landfill and the planning that has been conducted here. This area was selected, first of all, because it was centrally located as far as minimizing the hauling of refuse. The city was able to go into this on a long-term basis and have the added benefit of ending up with a very much needed municipal park.

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This shows about 60 feet of refuse covered by landfill methods and they are playing cricket.

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One of the things that you probably hear many times is the difficulty with burying some of this refuse in sanitary landfills. This is some bulky refuse that has been received by a private operator in Moraine County. He is required to and has for the last five years buried this material successfully without resorting to burning, the operations that I showed you in Los Angeles County also are conducted in this manner. All the refuse that is received, which includes some of this bulky refuse, is handled without burning. It does use up land more rapidly, but it can be done.

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Just to reinforce what Dick Eldredge mentioned several times, this operation here at Palo Alto was carried in the local press as a sanitary landfill operation. Obviously, in the foreground, you see some refuse, but they are attempting to enclose an arm of San Francisco bay by dumping refuse, and by no stretch of the imagination does that or anything like that justify the use of term "sanitary landfill."

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This, you can see, is another view of the same thing and it certainly cannot properly be called a sanitary landfill.

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This keeps coming up wherever you go, however. Now, in some of our operations, the matter of compaction and cover may be carried out without quite enough equipment, without quite enough know-how, and you get a result that looks like this. This is a sanitary landfill, so labeled by the city of Wichita, and you can see the reason the neighbors are not particularly happy about this. The basic problem here is two-fold and it has since been corrected, I am happy to say. The problem here is that the city had grown but nobody had bothered to get a little larger piece of equipment to use on the sanitary landfill. It was impossible with the small equipment that they had to stay on top of the work so that with the high wind that they have in this area, they had difficulty with the blowing of refuse as you can see here.

... Slide ...

Even though they had compaction and covering, it was not done rapidly enough.

... Slide ...

To go a little closer, this is Pittsburgh. This is another example of some difficulty in this business. If you look at the top center of the picture, you will see the Bell Sanitary Landfill which has been operated by the city of Pittsburgh for about twenty years. This is within the city of Pittsburgh, is operated by the city forces of Pittsburgh, and it is located on the edge of Pittsburgh on a projection that is surrounded on one side by the burrough of Crafton and over to the left of this picture, you can see another burrough. The effect of what has been done here has been to raise the level of the ground that they have been using for sanitary landfill some 128 feet above the surrounding level and, although this operation has had a spotty history in the past, the recent history of the way this has been operated has been quite good. The sum total effect of this, however, is that in spite of the fact that the city is making real efforts to get in and compact the refuse and cover it, the effect of screening by building this hill up and not giving enough attention to some of the little details here of trash on the finished slopes, has resulted in the burrough of Crafton coming in with a court case and successfully getting an injunction against the city of Pittsburgh to cease and desist this operation.

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This is a matter that is still being thrashed out by the lawyers as to whether this injunction is going to be appealed or whether they will have to comply, but the sum total effect of this was produced by the difficulty that the city had which was brought on by a lack of an overall plan of what the final evaluation was to be, and how this ground was to be eventually used, so that the surrounding neighbors are faced with an ever-growing mountain which, as I say, was over 125 feet high. It finally took them into court.

... Slide ...

We also have to worry about some of this car business. As mentioned earlier, since somebody else had put it in, let me just give you a figure here on this sort of stuff.

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The Commerce Department in May, 1965, completed a survey of automobile graveyards, junkyards, and scrap heaps along only the interstate and other federal aid primary roads. The nationwide count of this kind of stuff indicates that there are 17,726 such places.

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We mentioned earlier this matter of controlled burning operation and these last few slides will give you a look at that. This is what happens, as you all know, when you simply dump a pile of refuse out of a truck and burn it.

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This is what a controlled burning dump operation looks like. It is a far way from a landfill, but there is a noticeable amount of improvement in the amount of smoke produced.

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This is after the caretaker has done some scattering of this material.

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This is the result when it is lit.

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This is the overall view of such an operation. This is at Greenfield, an unincorporated community not too far from Bakersfield, California, about 125 miles.

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As I mentioned, the tin cans are removed on a bi-monthly basis. This provides some revenue and also makes it possible to use the site for much longer periods than would otherwise be the case.

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These things have been set up generally on three bases. Here is a layout or schematic drawing of the use of flat land.

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Here is another one, similar to the Greenfield operation.

... Slide ...

Here is a side hill method of operation.

That is it.

We have a few minutes for questions. I will be happy to try to answer any questions that you might have, and knowing that if I can't, there are probably people in the audience who would be able to answer specific questions.

Before we get into that, let me mention that this is the ASCE manual that I mentioned. The leaflet, "Do you need a sanitary landfill," we have put out features a picture of the Mission Canyon operation on the cover.

Two of the things that I would like to mention but I didn't cover have to do with newer approaches to this sanitary landfill business. Some of you may have seen the brochure, or the write-up for the D and J Press Company's machines which are now under construction at North Tonowanda, New York. This is a machine which will cost a quarter of a million dollars to operate. It is equipped with a Cleveland wheel digger that excavates a trench. A truckload of refuse is dropped in a hopper. The presses take over, and it extrudes onto the ground, digging down to a controlled depth of eight feet.

A somewhat similar approach is under way in Seattle where a very large mold machine is under construction. This machine is not self-propelled, will depend on a drag line or back hoe to operate a trench ahead of it. The machine itself is, again, a press which, in a three-cycle press action, as is usually the case for the baling presses, will extrude the compressed refuse out of the rear end of the machine, where it can be picked up. The excavated dirt is cast to the rear of the machine also, and the shoe holds this above the machine until the machine advances.

The action of the machine is controlled by the pressure of the refuse itself, so that these are two of the newer approaches that are coming along, both getting at the idea of very high rates of compaction, special machines, and immediate cover of all refuse.

Do you have any questions?

FROM THE FLOOR: When you stop to consider the amount of equipment, the material that you need for cover, the cost of hauling, access roads, and rodent control, do you feel that a landfill can be operated at a cost of a dollar a ton?

MR. BLACK: This will vary as to the amount. I gave you a range of something like seventy cents to a dollar a ton. Obviously, if you are talking about very small operations, you might not be able to come out with this figure. This is a recent report used only as an example of the Orange County refuse disposal program where they operate fills and transfer stations on a county-wide basis, and here they are quoting an operating cost of 68 cents a ton.

I don't think there is any upper limit to what it would cost or could cost if you had a small volume of material, but there have been landfills that have been operated with as few as five thousand contributory population, and there are a few of these listed in the back of the ASCE manual. These are all under one dollar.

This was put on in 1959 so there has probably been some inflation since then, but the answer to your question, I think, is best answered on a scale basis.

If you can set up an operation like the picture I showed from Monterey where there are several smaller cities which are all getting together, you can split up the overhead cost and enable you to do something here that each of the cities couldn't afford individually, or if you can't have a county operation or a district operation to get at the financing and the layout and the planning and operation cost, you have to go at it in that direction.

I don't know whether I answered your question, but I don't know any better way to get at it.

FROM THE FLOOR: Do you have any recommendations as to the height of the water table, how far to stay away from the water table in the piling of refuse? We don't have the mountain terrain around here that you showed in most of your pictures.

MR. BLACK: Well, the work which has been done by the water pollution control people in California, first of all, they have been worrying away with this question for practical reasons, even in that dry country. There are a number of sand and gravel pits where they have made deep excavations and if they can utilize these, they can save considerable other ground which might have to be used for refuse disposal.

First of all, they insisted that the refuse not be deposited within the water table area, either currently or where the highest water table was of record.

Above this, they are generally insisting on a minimum of twelve feet.

As I say, this is in a dry condition. There are some of these situations -- several of them which you saw on the slides. The one in Waukegan, Illinois, and several of the larger ones in the Chicago area, they are not insisting on this kind of coverage, but I think that Dr. Hackett and perhaps some of the others here can give you a better answer on this than I feel qualified to do.

There are certain things that you can do here. One of them is sealing the site before you start. This has been tried. There are other approaches, such as the bridge use, actually making a fill so dense that by actual measurement, the resistance to the passage of water is higher through the fill than it is through the undisturbed soil.

There are some approaches to this, but certainly no easy cut-and-dried answer.

FROM THE FLOOR: I was very much interested in some of the remarks that you made and I would like to hear them amplified. I notice this one landfill was operating in a marsh land in some of your later pictures, showing the structure laying over the top of the fill. I was thinking about comparatively large landfills where you have a rapidly moving face, how do they operate the trucks through these two feet of mucky clay in the spring of the year? What is the wet weather condition, the spring weather condition, and what are the control procedures to keep from miring the truck down? That seems to be an awful problem in most places.

MR. BLACK: During wet weather, you can compact the refuse and run right on the refuse, if you are talking about the last short distance from a carefully prepared road, or you could put only a small amount of cover material over it.

This actually is better for trucks to operate on than if you put on two feet of cover material, if you are going to have to have the truck operating over it. If you have no choice -- I mean, if you don't have any granular material, this is what you would be forced to do.

FROM THE FLOOR: Can you break down the cost that you gave us on those dollar figures? I did not get them as you gave them the first time.

MR. BLACK: Yes. These were the Los Angeles operating figures. It was 23 cents a ton for the depreciation of the equipment, 43 cents a ton for operation and maintenance, exclusive of equipment, and 11 cents a ton for billing and accounting.

These operations have had to be set up on the basis where the user fees covered all the overhead, all the engineering, all the inspection costs, and the Los Angeles County sanitary district has gotten into some things that not many other operators have.

For example, they fly these sites twice a year and take stereopticon pictures of these fills and get the rate of use of that land area in order to check their ultimate capabilities. This, of course, lets them know before they get to the end of a job how they are coming out on this matter of allocating costs.

FROM THE FLOOR: In its cost breakdown, did I understand you to say that this included the depreciation and land cost as a part of the 23 cents?

MR. BLACK: Yes.

FROM THE FLOOR: In addition, another question which has been discussed, but maybe -- it hasn't been discussed, but maybe you are going to bring it up later, the use of land for landfills in the future for other than parks. For instance, I think in one of those pictures you gave the Sexton operation in Chicago. Are they not having to take some special precautions on building to prevent the gas which is being generated from coming up underneath the structure, and so forth? What about this?

MR. BLACK: The difficulty with the use of these sites, as you mentioned here, is that you may have methane gas that is produced. That is the common one. I think that a lot of our older operations have been built and then somebody starts worrying about what we can do with the land after it has been filled in.

This, to my notion, is the wrong way to go about this. There are no reasons that I can think of, if you are going to fill in an area, that you can't maintain or actually lay out a road that can be used during the filling operations, but that can be useful for the ultimate use of the property, enough space to get utilities along the road so that you don't have to put them in the fill, and building sites also.

This is a much cheaper approach to it than to get to some of these deeper fills which are 180 feet deep, and you know you are going to get some settlement here. To start worrying about what is going to happen to your building when you are going in over a hundred feet of refuse underneath, you are going to get some problems.

I think the best approach would be to lay it out and plan it on the basis -- or determine what you are going to use it for, and if you don't know exactly, you will say that a likely portion of this land can be saved so that it will support sizeable structures.

FROM THE FLOOR: We know that the material in certain landfill sites are degrading at a fairly rapid rate, and others, the degradation is almost nil. Are there any geographical characteristics that account for that?

MR. BLACK: I don't have the complete answer for that. Some of the speakers who will appear on this program later have some information on this from the work they have been doing. Basically, it depends on the availability of oxygen within the fill. If you get a fill that is pretty loose and as it settles more oxygen gets in, more decomposition takes place and this sort of thing can proceed pretty rapidly, particularly where you get a sizeable amount of rain.

There have been reports from Louisiana, for example, where they reported they could go in after five years and reuse the same material for cover.

In these California fills, the deep ones where the conditions are pretty dry, I have looked at some of this stuff that has been in the ground 18 and 20 years and there has been virtually no decomposition once you get away from the surface area, so that it is a combination of things, the presence of air being probably the critical thing, and the amount of moisture getting in and having a secondary effect on it.

FROM THE FLOOR: Would it not be desirable, then, that the material be graded as rapidly as possible so that the site can be reused again?

MR. BLACK: You mean reused in the sense of digging it up and putting more refuse in?

FROM THE FLOOR: Right.

MR. BLACK: The only trouble with this is if you have ever tried to dig in a refuse fill, this stuff interlocks. You have a problem whether the putrescible material is decomposed or not, this is a horrible mess to dig into, whether it degrades or not, unless you can separate out the stuff as you put it in.

I wouldn't advise anybody to go back and re-dig it if you can do any other way to figure it out.

FROM THE FLOOR: I mean depositing on top of it.

MR. BLACK: There is no reason if you are depositing on top, there is no reason not to go back in. Some of these you saw over here were repeated layering.

FROM THE FLOOR: About the subject of weighing which you showed on some of your slides, what are the advantages and disadvantages, and is there a certain size factor here of community beyond which it might not be feasible to weigh? What are some of the factors to be considered in weighing?

MR. BLACK: Actually, I think we are going to have to do more weighing. The practice is not too common. Most of the allocation of charges on landfills, incinerators and other methods, is done on a volume basis. This is fraught with all kinds of difficulty and opens up possibilities of chicanery and everything else. The only hope is to get everything on a weighing basis. Again, this costs money.

In the Los Angeles area, they went to this method because of their requirements in the way this whole system was set up originally of having to allocate the cost to the users, whether they were city folks, private contractors, or whoever they were. The weighing operations that I showed on the slides here and which you have heard about, the smallest one would be in about the neighborhood of two hundred thousand population, but I certainly believe we are going to have to come to more of this in order to get our financial arrangements in order to correctly allocate some of the cost involved in these multiple use projects.

Even if there is only one city in operation, it would be advantageous to have weight figures shown all the time.

FROM THE FLOOR: Is this also used for a cost analysis as well as for production and other things?

MR. BLACK: Yes, some of the figures you heard yesterday were developed by Mr. Rogus because of the fact that they have gone into a program of weighing for their own management control of what happens in the city, and this enables them to be more precise in their decision-making as to what is going on.

FROM THE FLOOR: Is it generally accepted that two feet of compacted cover finish off land, and if so, why is two feet used if six inches would be enough?

MR. BLACK: Well, we, in this recommended standard for operation, talk about three different things in that area. One, the six-inch layer is put on immediately. This has been demonstrated to be sufficient where you are talking about a very short-term period.

On the surface of multiple lift operations where you may not be coming back in a relatively short period of time, you put on a foot. This protects from erosion, and on the final surface, you put two feet. This provides enough root zone for getting some cover to prevent soil erosion. It allows for any possible uneven settlement, also.

This is not so real cut and dried as it may seem. In the ASCE manual, for example, they have a table on the back that has some figures on how much cover is involved. The depth in inches runs from a minimum of 6 all the way to 48, so this, in a large amount, depends on the situation that you find yourself in on a local piece of land, the type of equipment you have, the skill of the operator you have.

A lot of things have to go into the determination of this on the basis of the considerations from the local operational standpoint.

Many of the legal requirements have been set on the basis of generally prevalent soil types that are in an area, so this is the basic reason for some of the difficulties in here.

It is keyed back to the type of equipment that is generally available for landfill work.

FROM THE FLOOR: What was the haul distance of this Mission Canyon operation? I was very much impressed with that. I think you said that handled 3500 tons per day.

MR. BLACK: Yes.

FROM THE FLOOR: This was a very large operation and as a result, this one dollar per ton or approximately that is a pretty reasonable figure which means they could go a longer distance to get to this which I assume out in California is normal in some of those areas.

MR. BLACK: I don't know exactly how to give you this answer. I don't know whether anybody knows it. The way these operations are conducted, as you saw in the picture, there were some vehicles there from cities such as Beverly Hills which is a good distance away. There are private operators that are operating in the immediate vicinity, less than three miles.

The average haul -- I could come up with a figure, but I wouldn't have any confidence in it. Basically, in the area of Los Angeles County, you have a great many cities. A few of these cities operate their own disposal facilities. Los Angeles itself is about the only one that has refuse facilities. They operate on a landfill. It is a different location, but Los Angeles city trucks also use the operation that you saw.

Basically, from the collection standpoint, you have to determine that. Some of the private collectors I have seen actually have this laid out on a map form for their drivers that they have taken in and colored in with colored pencil sections of the city. They have keyed this. "When your last pick-up is in this section, go to this disposal site."

There are quite a number of possibilities here. They don't all go to the same plant all the time.

FROM THE FLOOR: As a side comment to this opening up of a dump which has been filled for years, it is much different from what you mentioned out in California where it is dry. In Cleveland, they are putting the new Interstate 71 into Cleveland. They are going past the Jones and Laughlin Steel Company plant. Up on a hillside, there is a ravine just to the west of this plant. Over the years this was apparently a popular dumping spot. This was operated for years with a partial cover, I under stand. This goes back, I have been told, for 35 or 40 years. At any rate, they saved quite a bit of money putting this in here, but I don't know what the unit cost is going to be now to take it out, but they do have to take it all out. This is a fantastic operation, both from the smell and other things, because there are people living right on top of it. This stuff was pretty rough. This was even worse than the stockyards at the highest period of odor in their lifetime.

MR. BLACK: As soon as the air got to it, it started to decompose further?

FROM THE FLOOR: Yes. There was an open seepage along the road, too. We drive by there to work every day, and there is quite a story about the visible effects, as well as the odor.

An outstanding example of what happened, the dollars that were saved a few years ago are being put back now to put a highway in on top of this. It is all very simple.

MR. BLACK: Very true.

FROM THE FLOOR: In the mechanics of compaction, is there an optimum layer to be compacted prior to the application of your fill material on top of it? We speak of covering it daily, and I wondered about that.

MR. BLACK: Well, these large operations in Los Angeles County, as I mentioned, the depth that they place on there is about four feet at a time, but they are operating D8 size tractors. It is very wide equipment as a general thing, and it is spread out to about two feet at a time, vertical depth, not the depth on the bank. This enables them to get some crushing effect of some of these items. There are some special compactors that have been used, but this is really just beginning in landfill practice, and they have not been extensively used.

FROM THE FLOOR: Normally they use road building equipment, earth moving equipment?

MR. BLACK: Yes.

FROM THE FLOOR: Would you comment, please, on the use of narrow ravines for landfill sites which are water courses and may have to construct storm sewers through the ravines before the landfill is constructed?

MR. BLACK: I have seen a few of these that have been done. Basically, I think you have already hinted at the thing that must be done to get the water through the fill area.

This, again, adds to the cost of using that kind of situation. It has been done successfully either with corrugated metal pipe or with concrete pipe where there is some advantage in going to this, but you have certainly to take this into account because you don't want the fill itself being completely washed out in case you get a gullywasher coming down, or you don't want to continue the drainage and leaching through the fill material, either.

It is not very often done, but it is possible.

FROM THE FLOOR: You don't think there are any side effects, then, from the water leaching through the fill and coming out through the storm sewer?

MR. BLACK: Not any particular problem here. The main thing you have to worry about is the water coming through the site. If you can handle this, you will have no special problem, but this costs money, of course, to take care of the storm sewers.

FROM THE FLOOR: You have 723 acres of land out there for three million plus people, and this is a garbage sanitary landfill. How long will this serve? Are they going to build a Sierra Mountain out there or something?

MR. BLACK: The life of the site, I am sorry I can't give you this figure offhand. I do believe that if we need to come up with a general figure that we are talking about the deep fills in the neighborhood of seven or eight more years, if the use of private sites that are now serving the same area are filled up and closed down and no more are opened. In other words, all refuse has to go into the Los Angeles county district sites.

The thing that is happening, they have recently opened up a new site in cooperation with the city of Glendale. They are in the process of negotiating for a major site in the Santa Monica Mountain region, the last really big piece. They figure if they can get this big one, that they will have sufficient capacity for about fifty years. They are going to have trouble in getting this site, I am sure, but this is what they are aiming for.

FROM THE FLOOR: I have a two-part question. Is there a recommended setback from the landfill operation to a residence?

The second question: Is this needed from a public health standpoint?

MR. BLACK: I don't know of any widely used figure of how many feet you should be from a landfill. These pictures in the Los Angeles situation were a matter of about 100 feet, which is pretty close. The main reason that you want to have some distance between landfill operation and residences is just the noise factor of the heavy equipment in itself that you wouldn't want to have to live on top of.

You do, during certain periods of the year, have some dust. You can get quite close to residences, or get this particular section filled in, finished off, and get back away from it. This is the way it is usually done. You come in and concentrate all your efforts in an area right up close to the residences and get that finished off in fine shape and then get away from it.

FROM THE FLOOR: If you have planned your use of the reclaimed land in advance, and in the interest of trying to minimize settlement, space conservation, burning, and decomposition rate, has there, in your experience, ever been any kind of shredder or crusher operation prior to a sanitary landfill operation?

MR. BLACK: There have been several people who have talked about this. I think from a theoretical standpoint, this has a lot of advantage. I don't know of anybody that has actually tried it. It might be a good thing to talk to some of our equipment people and see what ideas they might have along this line, but there hasn't been any such effort that I know of.

MR. CRANE: We are going to have to stop.

Thank you, Ralph.

Ralph will be back on the panel later, after the break, and we will still be able to discuss landfills and if you have any questions, why not jot them down and if they are not answered during the panel session, we can try it again. We will try to stay pretty close to schedule this morning.

... Recess ...

LANDFILL PANEL

Dr. James Hackett; Messrs. Ralph Black
and Richard Smith

MR. CRANE: We are behind schedule again, so please be seated. We are going to finish our discussion on sanitary landfill. We have Mr. Black with us who will act as chairman of this session. He says he doesn't have any more to add to the other statements.

We have two other gentlemen here who are going to add their comments and it is going to be open for discussion again.

The first panel member to speak will be Dr. James Hackett, the geologist in charge of the Northwestern Illinois office of the Illinois State Geological Survey in Naperville, Illinois.

Dr. Hackett received his Bachelor's and Master's Degrees from the University of Wisconsin. He earned his Doctorate at the University of Illinois. He has had experience as geologist with the Wisconsin State Highway Commission. Since 1951, he has been with the Illinois State Geological Survey where he is a member of the section of ground water geology and geo-physical exploration.

He has done considerable consulting work in the refuse disposal field, also with the agency of international development in Brazil.

He is a member of several professional and technical societies and has published in excess of twenty papers and reports on ground water and geologic aspects of planning and refuse disposal.

Dr. Hackett.

DR. HACKETT: Thank you.

The subject I have been asked to talk on is the relation between the physical environment and landfill disposal. This is a broad subject, indeed, and certainly not within the relatively short time that has been assigned here will I be able to cover it in its entirety. I hope that I will be able to hit some of the principal points in defining the physical environment as it relates to landfill.

Landfill is a means of disposal of a large variety of waste products. These products differ in their nature and composition of their biological and chemical aspects. In many landfills, in most of them, in fact, I suppose, there is no attempt to segregate these various products. Consequently, there is a broad array of both chemical and biological constituents that are made available for distribution into the physical system that exists at the landfill site.

Such things as the rates of decomposition of the fill, the production of contaminants, the retention or spread of these products, and their effect on the environment are determined by the particular meteorologic, geologic, and hydrologic conditions that constitute the physical environment of the landfill site.

The bulk of the waste products disposed in the landfill can be classified into very general groups of domestic refuse, industrial waste, used construction material, and incinerator ashes.

A new and somewhat more sophisticated member of the landfill family that is coming into the picture is radioactive waste. I suppose we could include, for completeness, one of our most recent institutions, the cemetery, although I am not going to discuss much of this relation of landfilling to physical environment.

Each source of these general sources have a characteristic assembly of material, but only refuse has really received much discussion in regard to its composition. A number of investigators, for example, have described the physical composition of refuse. You can draw an example from the Chicago area where the refuse is described in terms of percentage of waste, percentage of body, in terms of the following items: Paper, grass, garbage, metal, glass and ashes.

In England there is also a description of the physical composition of the refuse. It is classified in terms of paper, cardboard, rags, vegetation small and large, wood, garbage, miscellaneous combustibles and noncombustibles. Apparently refuse can and probably does contain anything including the kitchen sink.

The relative physical composition of refuse varies from region to region as well as seasonally within a region. Therefore, a characteristic description of the physical composition is very difficult and perhaps impossible to make. Perhaps a better way and maybe even a more useful way for the subject involved in this discussion this morning is to think of it in terms of its chemical composition.

I have passed out two tables. One shows the chemical composition of community refuse from the Mandan, North Dakota, study. This is abstracted from the table that was prepared by Mr. Weaver. You will note here that the composition of refuse is relatable to its chemical constituents.

It might be perhaps somewhat less erratic and variable in means of comparing one refuse composite to another.

This broad array of chemical and biological constituents was made available for distribution into the associated physical system through, one, leaching by water moving through the waste and, secondly, by decomposition of the organic constituents by bacterial action. Refuse can be a significant source of bacteria for decomposition and for disposition into the surrounding environment.

One study reported by Weaver, again, reports an average of 740,000 coliforms per gram of refuse.

Leaching from refuse has a high BOD which is indicative of a high bacterial concentration. The study of wet fill in England reported the BOD in the leachates showed 5150 parts per million. On the first table which I have handed to you, you will note on the last line is shown 5-day BOD of refuse both before and after burial. You will note here that the 10-month average for 5-day BOD is 77,050, and it ranges between 23,500 after 2 years of being buried and 30,000 at the end of one year. These are averages, of course.

The products of decomposition by bacterial action are dependent on whether the environment is aerobic or anaerobic. Aerobic, involving the presence of oxygen, results in a rise of temperature, development of carbon dioxide, which being heavier than air remains in the fill. This, in turn, makes a weak acid when combined with water.

Ammonia, which is oxidized from nitrates and nitrites and water are always present.

The anaerobic environment, deficient in oxygen, results in a rise in temperature and creation of ammonia. Ammonia is created in the form of ammonium salts. This is relatively inert, and being lighter than air escapes to the air where possible.

The leaching of the waste by water moving through it results in the translocation of bacteria and the taking into solution of the soluble contingents.

The second table is entitled "Composition of Leachates." I have prepared a summary referred to in parts per million of various chemical constituents as reported from the English study and from incinerator ash as reported in the California State Water Control Board publications.

I gave these two handouts because I wanted to use them for comparative purposes. As one would expect, because of the finer composition, finer grain composition of the ash, greater surface area, there seems to be a tendency for a heavier concentration of chemicals in the leachates from the ash.

As I stated before, the production of contaminants from the waste and their effect on the environment are determined by the meteorologic, geologic, and hydrologic conditions that constitute the physical environment of the landfill.

Let us go into some of these factors of the environment. First of all, we will deal briefly with the meteorological factors. These include precipitation, evapotranspiration, and soil moisture. These are the elements that seem to be most significant to this question. Precipitation, as we know, varies from region to region in the quantity and type, and it varies seasonally within a region.

Evapotranspiration, that is the release of moisture to the atmosphere from water surfaces, land surfaces, and the action of plants, depends on five things. First of all, the prevailing climate; secondly, the supply of moisture; third, the plant cover; fourth, soil type and structure; fifth, land management, that is, whether the land is in crops, whether it is urban, or whatever may be happening to it.

When the root zone of the soil is well supplied with water, the water loss depends primarily on the amount of solar energy received by the surface. This is known as the potential evapotranspiration and is a convenient unit to use in comparison between soil-water requirements and precipitation.

Average annual soil-water needs in this country range from 18 inches in the high mountain areas of the west to more than 60 inches in the parts of the southwestern desert. It is less than 21 inches along the Canadian border of the eastern United States, and more than 48 inches in Florida and southern Texas. However, unlike precipitation, evapotranspiration has quite an even seasonal requirement. It is negligible in the winter months as far south as the Gulf Coast plains and rises to a maximum in July. This general pattern is consistent over the country.

One means of showing the effects of the meterological conditions or the climate and how this may relate to landfill disposal, we can plot -- and this has been plotted in many studies, particularly for irrigation purposes -- the potential evapotranspiration for the precipitation of a region. This gives us quite a good idea of what our soil-water requirements are. It gives us an idea of the times of infiltration of water. It gives us an idea of the quantity of infiltration of water as it varies throughout the country.

I will step over here to the blackboard and draw a couple of graphs from different sections of the country to illustrate this point.

Along a base line, we will plot the months of the year. This will be January over here, and January over here, again. About in here is July.

Now, Berkley, California, has a pattern that goes something like this. On this line, we will plot inches of moisture. Here we will range from zero to about five.

The evapotranspiration pattern in this region starts off in January -- it is not zero. In January, it is about one inch per month, and it rises to about three inches per month and has a bell-shaped curve like this. However, plotting the precipitation record against this, we find that precipitation is at about five inches in January, decreases gradually to about zero in the summer months, and rises again in the winter.

This is precipitation. This is potential evapotranspiration, the amount of water that would be taken up into the atmosphere if an adequate supply of water is provided to the roots of the plant. It is not a measure of how much is actually supplied by evapotranspiration.

From this, we can subdivide this graph to certain zones. In about June, we have this line. This area from January to approximately April is the time of water surplus. Precipitation exceeds evapotranspiration during this interval.

We will have to go to the other side of the graph in order to explain what happens here.

This is the amount that is used up by the soil in the evapotranspiration process. Therefore, in here is the period of the amount of water deficit.

Then, when the precipitation exceeds evapotranspiration again, the soil-water deficit must be made up, and so we have a period of soil-water recharge. We will give that this factor over here. That is recharge.

This means that at Berkley, California, it is only during a portion of the springtime that water is available for infiltration through the soil into the ground. At other times, the soil-water is being taken up by the plants or is drawing on storage which must be replaced by the later rainfall.

As opposed to this, take a look at a pattern in Seabrook, New Jersey. Here we will run our graph to six inches. Again, potential evapotranspiration has this potential, however, it starts at zero in January, rises to a peak in July, and is back like this. This is the ET.

Precipitation, however, is a different pattern. It sort of jiggles back and forth through the year something like this. That is the precipitation pattern, significantly different from that of California.

Now, we are interested primarily here in the water deficit period and the period of soil-water recharge. As it turns out in this area, only this portion of the graph is a deficit period and only this through here is a soil-water recharge period.

That means that in the humid area of the northeastern United States, a significantly larger percentage of moisture is available for infiltration into the ground than in other areas.

If we were to make a graph of this -- I don't have one available for the desert region -- we would find a very definite deficit. In fact, the balance may be to a general water loss, because not enough water is supplied by precipitation in that area to provide for the soil moisture requirements.

This is one of the reasons why we have in our literature concerning landfill so many conflicting reports. Perhaps they appear to be conflicting reports on the adequacy of rainfall to leach refuse. A report from California reports that the rainfall is not adequate. A report from England says, "Yes, it does," and we have to look at our climatic conditions in order to evaluate this at any particular area.

In going into some of the geologic factors that are involved, one of the more important subjects is the relationship between rock type and permeability. Permeability, as you probably know, is the ability of a rock or earth material to transmit water. We should distinguish in this, however, between what we call inter-granular permeability which is the movement of water between grains, mineral grains, and linear permeability which is the movement of water through enlarged openings in a rock such as a joint, fault, solution channel, things of this type. These are two types of permeability and they are quite significant.

In terms of the rock materials, we can break them into about four different categories. First of all, what we call the unconsolidated material which involves the clays, silts, sands, and gravel. Primarily, it is a matter of intergranular permeability and the permeability is based on the grain size of the material. The coarser the material, the higher the permeability.

In some of the finer textured unconsolidated material, however, there is an opportunity for the development of linear permeability, particularly in the clay materials, by joining effects.

The next group we consider in this general categorizing are the consolidated sediments which include the shales, silt stones, sand stones, and conglomerate. These are consolidated equivalents of the materials I quoted before, clay, silt, sand, and gravel.

Again, intergranular permeability is the primary type of permeability provided in these rocks. They are somewhat lower in permeability than the unconsolidated equivalents because of the presence of cement, and there is some greater potential for linear development -- development of linear permeability through the jointing and faulting.

Another group of rocks are the chemical precipitates. These would involve such things as salt, gypsum, limestone, and dolomite. These are soluble rocks. These rocks, linear permeability is predominant and it can be quite high both in the lateral and vertical directions. This is because joints develop in such rocks and will be opened by solution, by water moving through them. In these rocks, and in linear permeability in general, there is a lack of filtering action, whereas in the intergranular materials, filtering is a significant factor.

The last group of rocks we would consider are those which we might call the igneous and metamorphic materials such as lavas, et cetera. These materials have a broad range of permeability, and essentially no intergranular permeability. The lavas, for example, have a high permeability because of the formation of gas bubbles and the inter-relation of these bubbles. Granite may have an extremely low permeability, but in all cases, we have to consider a linear permeability.

We could generally, then, list what we might call the permeable rock types in terms of their rated permeabilities, and we will distinguish between the intergranular and linear permeabilities. Intergranular permeabilities you could list in the general order of gravel, sand, sandstone, and conglomerate.

Under the linear permeability types, we find the salt flows, the salt lavas, limestone, dolomite, slate, shales, and jointed clays and granites.

We are mainly concerned, not entirely, but mainly concerned with those rock types that display good linear permeability and concerning ourselves with such problems as the travel of pollution and contamination from landfill.

Let's get then into a few of the geological considerations that enter into this question.

Here we are concerned with the mineralogic composition of earth materials and their relation to chemical constituents of solid waste.

Chemicals from waste, leached from waste, can react with the chemicals in the rocks to produce an entirely different chemical constituent. For example, in the decomposition of refuse, we have the production of carbon dioxide. This, with water, moving through the refuse, forms a weak acid, a hydrocarbon which, in turn, increases the solubility of that fluid forming calcium carbonate.

Calcium carbonate is a very common rock type, very common rock mineral. Limestone and dolomite consist of calcium carbonate or some other soluble carbonate. In our glacial drift in much of the area in which I work, the drift materials have a high content of calcium carbonate. Therefore, acid leachates moving through such materials pick up a considerable quantity of lime and we have a greater increase in lime from this action than from the leaching of the refuse.

Another aspect of this is the possibility of the replacement of ions in a mineral by an ion in the leachates. Now, minerals are known to have a certain exchange capacity. This means that they have ions in such a position on their mineral structure that they can be replaced by another ion. Consequently, as leachate is produced from a refuse, it moves through the rock materials that it may encounter, minerals of high exchange capacity, and there will be a transfer of ions going into play and we come out with an entirely different product than when we went in. This exchange capacity is very high in certain of the clay minerals.

There is another aspect of this ion problem. We call it attenuation. It is absorption or adsortion of ions to the mineral.

This is a matter of the charge on the mineral, and is the attractiveness of the ion to this charge, and it is related to the basic structure of the mineral itself that there are openings in which such ions can move and can be held in place. This is an important consideration, has come to be a fairly important consideration in radioactive waste disposal where the radioactive ions themselves can be trapped by minerals and held in a stable condition. This is, again, a factor most commonly and best displayed by the clay minerals.

Let's move on to some of the hydrologic factors that are involved in landfills. Here, hydrologically in the subsurface, we distinguish between two zones. Call them the zone of aeration which is the zone of soil-moisture and air. The zone of saturation is the zone of ground water. The separation between these two zones is defined by the water level in an open, uncased hole, and will rise to that point where the pressure of the water in the ground is equal to the atmospheric pressure. We call this the water table. This an interesting point. I won't go into it, but there is probably more confusion on what a water table is in a region than any other element. Any water level is called a water table, and it very seldom is. The water table is that point at which we change from the zone of aeration to the zone of saturation.

This distinction is important because the zone of aeration is primarily our zone of oxidation, and it is the zone in which aerobic conditions persist. The zone of saturation is the zone of reduction, chemically a zone of reduction, and it is anaerobic.

There are differences in the character of the water movement in these two zones. In the zone of aeration, water can move in any direction and it moves in response to surface tension forces.

In the zone of saturation, the water moves in response to pressure differentials, and when we are dealing, particularly with intergranular materials, this is laminar flow and is subject to analysis by Darcey's law which, in one form, is quoted, or can be quoted simply as Q, the quantity of water, equals the permeability of the material times the hydraulic gradient, that is, the difference in pressure, times the cross-sectional area.

Now, water in the ground has a definite flow path. There is a flow system, a three-dimensional system to the flow of the water. This can be determined by plotting, by measuring and plotting the distribution of pressure potentials within the system.

I will give an example of this type. Let us take an area where two drainage valleys are separated by an upland with a marshy area on the upland. Here is one drainage valley. Here is the upland. Here is the marshy area. Here is the other drainage valley. Here is the stream.

The position of saturation, the zone of saturation, is very close to the surface in this region, rises with the land surface, but not quite as steeply, and goes something like this over here.

(Dr. Hackett is demonstrating on the blackboard.)

That is the dividing line between the zone of aeration above and the zone of saturation below. All openings here are filled with water.

The flow system in such a region -- we will show the direction of flow by arrows. By this -- from this point here, the flow moves along lines like that. On the other side, we have a similar configuration. We have a series, then. This is the path at which water is moving through the ground.

This is known [illegible] a recharge area. Water is moving downward into the system. This is known as a discharge system. Water is moving up and being discharged into the system.

Note in this area, I have taken a humid climate and the discharge of the ground water is supporting the flow of these streams. Note, then, the inter-relation, the interconnection between the ground water deals with one system, really. We cannot separate them.

It is also important to know the effects of the area like this on the flow system. I should increase this a little bit through here. Here we may have a local disruption of the system and our flow system will be like this, and down through here there will be a point at which flow will not go into the marshy area, but will continue on down. This is very important in the location of a landfill if one wishes to maintain it in a safe position.

However, in this area, the discharge by evapotranspiration here follows along a discharge zone which must be supplied by the water from the system, and that is why we have this disruption. If we should fill this, like that, the movement no longer would be in that direction. It would have the same system as over here and what we have here would nowbe here in the line of the water movement downward. That is why the flow system is an important consideration when we are evaluating the physical environment.

Of course, the most important or most significant aspect of the relation between the physical environment and landfill is the problem of the water contamination. Both the production of contaminants and the movement within the particular physical system become involved.

The nature of the chemical environment of any area, and this is in terms of the production of contaminants, is a function of certain physical conditions.

First of all, the position of the zone of saturation determines whether you have an aerobic or anaerobic environment. The reactions of gases and chemicals is a function of the mineralogical -- in part, a function of the mineralogical functions of the material in which place your fill.

We have noted the importance of the development of carbon dioxide, and its effect on lime-rich rock, also the alteration of the composition of leachates by changing capacity, absorption and adsorption effects, the rate of decomposition and leaching is a function of saturation conditions in part. Continuous saturation means a lack of oxygen, but with the decomposition by anaerobic bacteria, there is decomposition, but perhaps not as rapid as in the condition where we have intermittent saturation. That is where the water level fluctuates through the fill or where the rainfall periodically penetrates the fill, or where there is periodic flooding, where we have periodic moisture followed by periods of rich oxygen.

This is probably the maximum environment for decomposition.

Opposed to that, we have the areas in which the unsaturated zone exists where there is a lack of moisture. The fill in these areas will remain fresh and unaltered for long periods of time.

The movement of contaminants is a function of the particular hydrologic and geologic conditions of the fill area. The zone of aeration, we talk about the role of the surface tension. Surface tension must be exceeded for movement. Therefore, for movement to occur, or movement from a clay to a sand may be highly restricted because the clay has a very high surface tension in relation to the sand. In fact, this relationship can form an effective barrier to movement. Below the zone of saturation, below the water table, the movement of contaminants are controlled by conditions of permeability, by the nature of the flow system, and by attenuation of the materials. Maximum rate of movement is determined by the permeability. The maximum amounts of contaminants moved per unit of time is a function of the permeability and the gradient, if we can apply a Darcey formula.

The direction of movement and route of travel is determined by the flow system as we have been pointing out here.

Recharge areas are regions of downward flow and a maximum route of travel. Discharge areas are regions of upward flow and there is a limited travel. In such regions, we are also likely to have high saturation points.

The transportation of contaminants is affected by the nature of the openings and the mineralogic characteristics of the material. Small openings will tend to have a filtering action for large molecules like the organic molecules and bacteria. Large intergranular openings, such as in very coarse gravels and in linear openings, there is little filtering action that occurs.

We also have removal of ions and contaminants by the reactive clay minerals.

Let's take a look briefly at this. I am running a little behind time, so we will begin to sum it up here.

Based on these considerations, we can make certain conclusions on the status of knowledge concerning the relationship between landfill and the physical environment. Some knowledge is available on the chemical and bacteriological composition of refuse and the leachates produced from refuse and incinerator ash. There is little knowledge of a similar type concerning waste type disposed in landfill. There is knowledge that leachate produced from refuse can contaminate associated water sources and, therefore, sites for disposal of these and other wastes should be carefully chosen to prevent such occurrence. All these factors appear to be closely related to the climatic conditions and the subsurface hydrologic conditions.

Movement of contaminants have been shown in many studies to be controlled by movement of water within the physical environment. Such studies have also shown that removal of certain constituents are a function of the geologic conditions that prevail.

Consideration of the elements of the physical environment that affect the production and movement of contaminants from solid waste disposed of in landfill allows for the conclusion that such wastes can be disposed of safely in certain environments. These conditions are as follows:

First of all, in those zones or in the zone of aeration above the reach of any fluctuations in the zone of saturation. In those areas where precipitation is inadequate to leach the buried wastes.

Second, in materials of such low permeability that even if saturated, the contaminants produced are effectively contained within the disposal site.

Third, in areas where subsurface water flow conditions are such that the contaminants produced cannot move from the place of disposal.

Now, in terms of some of the needs for more knowledge -- everybody always seems to end up with this -- first of all, there is a need for better knowledge of the constituent in all types of solid waste disposed of in landfill and the nature of the contaminants produced from these wastes.

Of particular concern are the large variety of industrial wastes that are probably dominantly chemical in character.

Second, there is increased need for knowledge of geochemistry of earth materials and its relation to attenuation of chemicals and biological constituents produced from the waste and of the reactions that will occur with introduction of test constituents into a particular physical system.

Third, there is need for better knowledge of the permeable characteristics of earth materials as they relate to the rate of movement of contaminants and the quantity of contaminants moved per unit of time. Of particular concern is the permeability characteristics of clays and other materials subject to jointing. There is need for specific knowledge of the subsurface water flow system of various regions that differ in regard to their physiographic, climatic, and constituent conditions. Such knowledge is often lacking at the shallow depths of landfill disposal. These investigations into the composition of wastes, the products derived from them, the reactions with the existing environment, their containment in physical system, should result in the development of environmental criteria to decide on the suitability of a site, or to determine the design of the necessary safeguards where that protection is lacking.

Thank you very much.

MR. CRANE: Thank you, Dr. Hackett.

We will hold the questions until the third member of the panel has concluded and we will devote the rest of the time to discussion.

Our third member of the panel is Mr. Richard Smith. He has recently moved to Columbus and is here as the district agent for the Ohio and Michigan district of the Division of Wildlife Service, United States Fish and Wildlife Service. He came here from the Fish and Wildlife Service in South Carolina.

He has a Bachelor's Degree in wildlife management from the University of Maine, has his Master's Degree in wildlife management from the University of Massachusetts.

MR. SMITH: While I am not too well versed in the cost per ton of collecting materials or the cost of disposing of them, nor do I have much knowledge of geological areas for locating disposal sites, I am pretty well familiar with wildlife problems at dumps or disposal areas where I have traveled many a mile on the face of these areas, all the way from Massachusetts to South Carolina, and I have come to find out there are numerous problems. I wonder if many of you have ever stopped to think of the safety and health problems that do exist in these areas. I know most of you have read about rats or have been involved in rat problems at dump sites and disposal areas, but have many of you ever stopped to think of the other wild animals involved, or even the bird species involved where dumps and disposal areas are good homes for wildlife?

There is good shelter available, and as the saying goes, many of them have never had it so good.

I think it would be best for me to cover a few of these species involved. First of all, the one that comes to mind to everyone is the Norway rat. I am sure everyone is familiar with this rodent, and I wouldn't accomplish much if I were to go into a discussion of its habits. I would say it is a potential carrier of disease, its numbers increase rapidly, that it is a very adaptable animal to most habitats and is certainly at home in a dump. Why shouldn't it be? A dump has the necessities of life. It has food and it has shelter. Shelter is found in the stumps, the trash and what-not that is deposited in the area, and food is the diet of man. What better diet can a rat have than the garbage disposed of by man in these areas?

In passing from the rat problem, I would like to say that this has become an increasingly important problem through the years, mainly through urbanization. I think fifteen or maybe even as little as ten years ago we weren't so much involved in that most disposal areas were outside the city limits. They were a good way away from most homes and there wasn't too much of a problem here, but now we have urbanization where building developers are building homes near dump sites, within a quarter of a mile, half a mile, or a mile, and while a person can complain about odors and something can be done about burning, nothing can really be done to keep the rats in the dump site, and when the population gets to a point where the disposal area will not support it, the rats move. Consequently, you have many calls to the health department and other city officials to do something about the problem.

There are other wildlife problems, so to speak, at disposal areas. One that is brought to mind is the problem of dogs and cats. Many people dispose of their so-called pets by taking them out in the country and just dumping them off. These animals often find a home at a disposal area. When this occurs, you often run into cases where you have packs of dogs and cats living on the disposal area. Two problems are encountered here. Often these animals get to be quite vicious and will attack people who are at the dump site to get rid of their week's accumulation of trash and there have been cases of this happening.

Sometimes there are law suits involved with the city in this regard.

The other problem is that with our increased human population, we are having an increase in rabies throughout the country and these animals living at dump sites are potential rabies carriers.

As yet I don't know of any cases of rabies being traced to this type of situation, but it is entirely possible.

This problem doesn't exist everywhere, as you well know, and it can be and usually is a direct result of the type of operation involved, and whether the town has an excellent dog warden or something of that nature. It can be controlled.

Many of you will wonder how you can get rid of this type of problem. I think it is one mainly of education. Also I think one solution to the problem would be better enforcement of the dog regulations.

Other animals often take up quarters at dump sites because it is a readily available source of food, but there are often incidental dangers. We run into cases of raccoons, skunks, possums, and so forth feeding at dump sites. Other than the rabies potential, there is not really too much concern with this type of problem. I might add in some sections of the country, I have been involved with a problem of bears feeding at dumps. Many of you might not know it, but a bear is what you might call a walking garbage disposal unit, and where you have a population of bears, you often run into this problem. I know in the State of Maine -- and I assume in most of Michigan -- there are a number of complaints received because of bears being in the dump disposal area when people have come to dispose of their trash.

Next to rodent problems, I think our prime concern is the bird problem. I know many of you who have lived or worked in cities located along the Atlantic Coast, the northeast, particularly, and along the Great Lakes, know what I am talking about because, like the rat, any of the sea gull species are attracted to these disposal areas. While the bear is a walking disposal unit, I guess the sea gull is a flying disposal unit. Unfortunately, gulls like garbage as much as rats. Along these seaboard areas, along the Great Lakes and any large water bodies, many of your disposal areas are near water sources, I guess mainly because the land is cheaper or the people wish to fill in these areas and reclaim the land.

In doing this, they attract mainly sea gulls. Along with this thought, many of your airports are located also in these water courses, and nothing attracts a gull more than an open dump or a disposal area with food and an airport close by within ten or fifteen miles where he can nest, loaf, and just hang around. When we have this, we have a safety factor induced here because you have the extreme hazard of gulls and airplanes colliding. There have been a number of cases of this sort. Fortunately, in this country, there haven't been any deaths, but there is a considerable number of aircraft that are damaged each year from sea gull strikes.

The second, maybe not as important a problem encountered by sea gull disposal area is the relationship that many of these gulls have where they feed in a dump, find a choice morsel such as a steak bone or something like that, and then they fly from the dump across the city, and in the process drop this garbage down in the city. Some of the areas in New England where I have visited, you can trace the flight line of the gulls from the dump to the water by the garbage. It suns right through the town from the dump site to the water. This may not be a safety hazard, but it arouses the ire of the housewife and they march on city hall and things get done, then.

We have other bird problems at dump sites, for instance, starlings and pigeons. They all feed in these areas, especially in the wintertime. They, in turn, carry bread and so forth from the dump to other areas within the city and complaints are passed on down the chain of command.

I might add that within the last fifteen or twenty years, the sea gull population along the northeast has tripled, I would say. They finally decided the main reason for the increase is that man has caused it through his disposal methods. Many of the areas in cities in that area are using open dumps which are a factor in gull reproduction and survival.

In previous years it has been a lack of food in the wintertime that reduced the sea gull population and now there is no problem because we have these disposal areas which the birds can feed on. It is not uncommon to go to a disposal area in Massachusetts, New York, Connecticut, during the winter months and see anywhere from 30,000 to 50,000 sea gulls feeding there.

Much has been or will be said about the different types of disposal areas during your week here and I know that open dumps have been mentioned. Sanitary landfills are being discussed now. No doubt there will be talk about incineration, and there is to be discussion on composting, but in regard to wildlife problems, all the wildlife problems of any type can be solved in one way and that is just remove the garbage. If you remove the food source, you will have no more wildlife problem.

This is easier said than done. An open dump or disposal area fails to do this in every way. An improperly run landfill system fails to do this and it is no better than an open disposal system.

A correctly operated landfill system will, I would say, reduce the wildlife usage, or rodent usage 99 per cent. Of course, incineration reduces it almost 100 per cent, although I would caution those who are involved in incineration to be aware of the rodent problems that occur at the incinerating plant. Droppage from trucks entering the area often cause a problem. Also many of your incinerator plants are over-taxed and a lot of disposal is not completely dormant or reduced and it is deposited in a system where it is buried, and you might attract rodents to this type of situation.

I am not too familiar with composting, but I assume that, like incineration, this would just about eliminate the animal problem.

A few of the towns and a number of the cities have failed to use incineration or composting and a good many of the small towns and a good many of the large towns depend on open-face systems or sanitary landfills which are often improperly operated. Consequently, many towns and many cities, even, have rodent and wildlife problems. These people should expect these problems until they correct their type of disposal system, but it is not necessary that you have to live with them. You can maintain the same type of system with a minimum of problems.

Like I say, little can be done to an open-face system which has just attracted too much wildlife, and little can be done to control or to stop infestations of wildlife. The main problem, I would say -- one thing that can be done, is that annual or semi-annual rat control programs can be carried out in these areas.

The only solution, really, is to convert to a sanitary landfill system that is operated correctly, or incineration, or composting, but I caution you, if you ever are involved in changing from one system to another, please, by all means, control the rodents before you switch over. If not, your troubles are just beginning because with the lack of food, the rodents will move out of the area and infest your whole city if you are not careful.

I think with a sanitary landfill system, your main objective as far as wildlife is concerned is to make sure that the disposed material is covered each evening, if not oftener. I have been at sanitary landfill systems that appear to have been in good operation, but there have still been a population of sea gulls or other birds hanging around, and when trucks dump, they feed in the areas. If it is covered nightly, your rodent problem will be drastically reduced and you will have no other wildlife problems.

To those of you who are involved with open-face systems, or sanitary landfill systems and have rodent problems, you might be interested to know some of the means of control. We are an advocate -- the Bureau is an advocate of one of two means, either hiring a special control operator or doing it on a contract basis to take care of the problem.

Another alternative is to train your own park personnel or public health personnel, city health personnel, in the correct methods of doing this.

We advocate using poisons. You can reduce the rodent population, but because of the hazards involved, we only use two types, one zinc phosphide and the other is red squill. I prefer zinc phosphide myself, I guess mainly because I was trained in its use. We use it in a one-to-four ratio with either a grain type bait or a meat type bait. It is usually not too expensive to use, and you usually have good results. You never completely eradicate all the rodents living in the disposal area. Even if you did, you would have re-infestation from surrounding areas, so we advocate at least annual programming, and sometimes, if possible, semi-annual programming. It should be done in the fall of the year, mainly because this is when your greatest concentration of rodents is found at the dump sites. The spring and summer populations have built up, the surrounding rodents are living in the woods, have moved into the dump for the winter, and we find we get best results at this time of the year.

We caution, or I would say, we do not attempt to use anti-coagulants in the dump area, mainly because of the expense involved. You are dealing with a large number of animals. It takes a phenomenal amount of anti-coagulant to achieve control.

Other wildlife problems that arise, for instance, dogs and cats and so forth, can usually be taken care of with a minimum of effort. If you have a good dog warden in the city or town, this is usually the solution. If not, trapping or use of intoxicants or something of that nature will solve the problem. Of course, dogs and other animals don't reproduce as rapidly so it usually doesn't take as much effort to accomplish control as with rodents.

The bird problem can only be solved by removing the food source. There is no way of frightening the birds away. Many of these species are protected, cannot be destroyed, even if we knew how, so I would think the only way to stop the problem, if you have a problem, is to change your system, and if any of you are going into a landfill system, make sure if you are on a water area, or near lakes or coastal areas, that the landfill system is operated at least fifteen miles from the city airport and away from the water if at all possible. If you are away from the airport, you will stop your problems with safety hazards, but if there is a golf course close by, your sea gulls will just go and roost on the golf course. This runs into complications in that golfers frown on feathers and droppings on the fairways and greens.

In closing, I would just say that if you are currently involved in rodent problems, good luck. If you need any help in determining methods of control or advice on what to do, feel free to call upon us. The Division of Wildlife Service has an agent assigned to each state and he is available for help and he will come if you request that he come.

That is all. Thank you.

MR. BLACK: I see we have a few minutes for questions. Since I have been chosen to ride herd on this session, I think I will utilize the opportunity to exercise a prerogative of asking a question to get things started here.

Dr. Hackett, in following through your presentation on the location of sites, one thing occurred to me. I wonder if you could give us your comments on the modifications which do occur?

It seemed to me that you pretty well are considering the landfilled operations in total, not breaking this down into any differentiation between open dumps and sanitary landfills. More particularly, in a sanitary landfill operation where you do get a cover over this refuse, the cover is graded, usually this is a minimum grade of one per cent. Won't this work toward minimizing some of your rainfall and other precipitation and leaching of some of this material?

DR. HACKETT: It undoubtedly will. There is no question about it. However, one point that, again, probably the principal point I was trying to make is that it depends upon the particular environment you are in. If you are talking about a place where rainfall is low, something of that nature, or the distance to water is great, such as in permeable materials, then these things can be very effective. However, we do have places -- say, let's take in this region, the humid area of the country where we are likely to have relatively tight material, but interspersed with permeable material. In such area, water saturation levels may be so high that it is difficult to find a place to put a landfill in so-called "in the dry" and consequently the preparations you may do at the surface are only part of the problem.

Does that answer your question?

MR. BLACK: Thank you.

Gentlemen, do you have any questions?

FROM THE FLOOR: We have a little wildlife creature called the diamond back rattler in Georgia, and we have on occasions observed these critters around some clandestine dumps. Do you have any suggestion on control of diamond back rattlers, or have you had experience with this problem, or any other snakes, for that matter?

MR. SMITH: Since I spent many years in South Carolina and Georgia, I know what you are talking about. The snakes are attracted to the areas because of the rodents. One solution is to get rid of the rodents. The only other thing I can tell you is that the South Carolina people carry a shotgun and a pistol.

Rodents are very susceptible, I am told, to DDT. Merely passing over a band of DDT will kill snakes, I am told. You can take that for what it is worth.

FROM THE FLOOR: I have two questions for Mr. Smith. In connection with protected birds, are the migrating game birds, to your knowledge, using these dumps as potential resting spots or places for food?

I will ask the second one. Has there been any particular work done toward chemical applications on the faces of the fill, such that you might postpone the need for covering it with earth?

MR. BLACK: You mean chemical application for the control of rodents, or for what, now?

FROM THE FLOOR: Actually, I was thinking about the control of rodents and wildlife but, secondly, possibly as an aid in beginning the decomposition or more or less protecting the face from the release of worms and flies for a period of a few days, to cut down the labor cost.

MR. BLACK: Do you want to take the mike first, Mr. Game Bird?

MR. SMITH: There are a few birds that are not protected by state or federal regulations. Those not protected are pigeons and starlings that would be found at dumps. All the game birds are protected by the state regulations and all the non-game birds are protected by federal regulations, and to poison or to destroy or even to reduce gulls, for instance, you need federal or state permits.

Don't get me wrong, you could probably get these, but it is not the solution. You could not destroy enough of them to be effective.

FROM THE FLOOR: I was particularly worrying about the ring-necked pheasants, whether they might be found at the dump.

MR. SMITH: It is possible. I am not too familiar with them, but around Massachusetts, many pheasants are shot at the dumps, so it is entirely possible that they might collect there. Morning doves also are found at dump sites. This is one problem we run into in rodent control so that we often kill a number of game birds -- not often, but we can occasionally do it.

MR. BLACK: Regarding your second question, the application, possibly, of some kind of a chemical that will permit you not to cover daily, I have heard of some attempts being used to spray insecticide for fly control and, believe me, this is a waste of time and money to expect you are going to get any results here.

As far as for other purposes, it is a little hard to conceive any other material that would be cheaper to get a cover than the earth itself.

FROM THE FLOOR: This question is directed to Dr. Hackett. What data is available through the state or the United States Geological Survey, say, for a community or anyone interested in studying his particular problem? Did I understand that the shallower surfaces, this is the area where there is not much other than local boring or a study being made locally? Are there such things as soil maps or things of that nature available to help determine site selection?

DR. HACKETT: Of course, there is a considerable amount of data available. You mentioned the soil mapping. This is data relating to the particular conditions. In many states there are excellent geological surveys and there is a considerable amount of information from such agencies.

In my reference to the lack of knowledge concerning the near surface aspects, I was referring particularly to this aspect, the flow system. The reason for this is primarily that studies in the past of subsurface water have been in regard to water supplies.

We may be dealing with a system here in which water supplies occur down here, out of the system we are concerned with, yet this may be a problem of pollution contamination of a drainage or a lowland area, this type of thing.

It is in these areas that we lack particular information, in the nature of the flow system at any particular locality.

I cut short a few of the comments I was going to make because of the lack of time. There are programs which you can conduct to determine these features. Being shallow, it does not require a very extensive program. It is not out of the reach of the individual city investigation. Through the hands of qualified professional engineers, hydrologists, et cetera, one can establish the characteristics of this and evaluate what the effects of disposal at any particular locality are likely to be.

FROM THE FLOOR: There is always an attempt to use a gravel pit for a focal point, and these are full of water. People living in the community take their drinking water from the same strata. How far away, as a rule of thumb, should you be concerned with chemical pollution with wells in a sand and gravel strata?

DR. HACKETT: The answer is simple. I don't know.

This problem of the movement of chemical pollutants needs considerable study and a large amount of work. A great share of the work has been done on biological constituents, bacteria. If you are involved in a filtering medium like sand, fine sand, this sort of thing, they do not travel very far, but the chemical constituents do.

One of the reasons that this is a problem is, again, in terms of this flow system. This is a fundamental aspect of this whole problem.

Water in the subsurface will move along these lines of flow and will not tend to disappear and there will be a tendency for a lack of dilution in the ground, not until it gets into a surface water body or an area of turbulent flow will the volume of water itself really come into play.

They can move considerable distances in this manner. Again, it is a matter of concentration. You have a whole range of chemicals involved.

What concentrations are you concerned with? This determines some of the answer to this question. You have to make up a scale for the chemical constituents and that has not been done, to my knowledge.

MR. BLACK: Generally, we try to avoid places where you obviously have got water to be contaminated.

FROM THE FLOOR: In much of the general literature on sanitary landfills today, it suggests the use of marginal or submarginal land.

In most glaciated areas and other areas, we have a preponderance of organic soil deposits. These can't be used for most urban uses, and in terms of agriculture, they are many times useless, but many of these extend to depths -- well, I know personally of some that are 100 feet deep.

Is there any research that has been done with the development of sanitary landfills and organic soil deposits?

DR. HACKETT: I don't know of any research, but I can make some comments.

Organic soil deposits usually occur -- because they are discharge areas. These are depression areas in which the water movement passes, which I will show on the blackboard, and they are directly in this area. These are usually enclosed depressions and not surface outlets. Under these conditions, there is no reason that I know of why they cannot be used adequately for disposal purposes, provided the system does not so disturb -- is not so disturbed that it turns from this to this.

If we are developing this on a slope as in the very poor sketch which I put up before you, when we will fill this, for example, we change that environment and we change the subsurface flow system, and we can now -- if perhaps this is underlain by permanent material, we can change the direction of flow from being toward this zone to away from it, and then introduce the leachates into these deposits, so whether or not you can use safely such a locality depends on your specific conditions at that locality, but I know of no specific research done on it. I know such areas are being used and I don't think they have had too much results.

MR. BLACK: This is correct as far as I know.

FROM THE FLOOR: I have just one question for Mr. Smith. A couple of years ago I worked with some men on an animal control project and they were experimenting then with fluoroacetamide, and it did get rid of the rats and there has been no recurrence. Have you had any experience with it, or is it still being used?

MR. SMITH: Unfortunately, the only experience I have had is the report which you have just given and which has been written about. The reason we don't use it -- in the report it is recommended to be used in sewer systems. You are speaking of sewer systems, aren't you, in Akron?

FROM THE FLOOR: Yes.

MR. SMITH: The reason we don't use this on an open dump or sanitary landfill system is the dangers involved.

FROM THE FLOOR: What was the material?

MR. SMITH: Fluoroacetamide, A-10 is what it is. Many of your pest control operators -- I don't know about Ohio since I haven't been here long, but some of the other states permit its use in building, but it is done at great risk. The fish and wildlife service doesn't recommend it because of the hazards involved. I would think in a sewer system it would be relatively safe, but out in a countryside where people and other animals can get at it, it would be highly dangerous.

FROM THE FLOOR: Would thallium salt be the same?

MR. SMITH: Yes. We do use A-10, but entirely in the western part of the country where populations are considerably reduced and it is used mainly for the control of prairie dogs and gophers, and such things.

MR. BLACK: We have run out of time. It is time for lunch. Thank you.

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TUESDAY AFTERNOON SESSION

INCINERATION

The Tuesday afternoon session of the Seminar convened on September 21, 1965, at 1:00 P.M., Mr. Rosendahl presiding.

MR. ROSENDAHL: This afternoon will be given over to INCINERATION and your chairman for this afternoon will be Mr. Abraham Michaels, deputy street commissioner of sanitation, Philadelphia.

Upon graduating from North Carolina College in 1942 with an engineering degree, Mr. Michaels worked with many manufacturing firms as a designer and as an engineer. In 1949, he entered the public works field as an assistant engineer at Long Beach, New York, and in 1954, he took over the design and operation of the refuse disposal facilities in the city of Philadelphia.

In 1960, he was appointed deputy street commissioner in charge of Philadelphia sanitary division. This entails full responsibility for all aspects of the solid waste service, including refuse collection and disposal, street cleaning, as well as design, maintenance, and operation of municipal disposal facilities. For the past several years, he has been chairman of the American Public Works Association solid waste committee and is an active member of many other professional organizations.

He has participated in numerous studies relating to the field of solid waste disposal and has also presented numerous papers on this subject.

At this time, I would like to present to you Mr. Abraham Michaels.

MR. MICHAELS: Thank you, Mr. Rosendahl.

Good afternoon, gentlemen. There will be a slight change in the program. As indicated, I was supposed to speak for an hour and fifteen minutes. That is more than I like to speak. I don't know enough to talk that long, anyhow. Cass Rogus, who is most eloquent, told me some time ago that he could solve all of my speaking problems this afternoon by preparing a paper on the subject of incineration.

Actually, his paper will sort of act as an introduction to the afternoon's programs.

You know Mr. Rogus. He spoke to you earlier in this conference, so I will not waste any time in attempting to introduce him further to you. Without further loss of time, I give you Cass Rogus.

MR. ROGUS: Thank you, Mr. Michaels, and gentlemen. My understanding is that this is a plain program. Accordingly, the paper which I have prepared and which I will read to you deals primarily with the basics of incineration. I am sure if you have more profound questions after the paper is delivered that the speakers on the panel here will be able to answer for you.

... Mr. Rogus presented his prepared paper ...

INCINERATION OF SOLID WASTES

By Casimir A. Rogus,
Director of Engineering,
Department of Sanitation,
New York City

The disposal of municipal solid wastes in the large community (100,000 population or more) has increasingly favored incineration. The last decade's tremendous upsurge of urban growth, the difficulty of obtaining adequate and suitable lands for "sanitary landfills," the ever increasing per capita output of refuse, and the progressively increasing calorific value of refuse have stimulated the construction of municipal incincerators. Although refuse incinerators, in this country, date from about 1880, their development in the past progressed slowly. More recently, however, under stress of competition and the municipalities' demands for an ever better product, substantial improvements have been made in the design of furnaces and their component parts and auxiliaries. Similarly the phenomenal increases in labor rates within the last two or three decades have dictated the application of mechanization and automation to the fullest practicable limits. Under these stimuli modern incineration has developed by leaps and bounds.

MUNICIPAL REFUSE INCINERATORS

Central incinerators are power plant like structures designed to burn refuse under controlled, nuisance-free conditions and at relatively high temperatures for the purpose of reducing the combustible components to an inert, organic-free residue which can then be readily disposed of by landfilling. Incinerators may be either of the "batch" type or of the "continuous" type. The former operates with intermittent charging of refuse and an intermittent discharge of residue, thereby introducing non-uniformity in burning temperatures, stirring up fine dust into the discharged air stream and subjecting the refractories to shock temperatures. For these and other reasons the batch type furnaces are going into disfavor except for the very small plants. Since the continuous type furnaces overcome these shortcomings and are in addition more economical to operate, they are now generally favored. With this in mind our discussions herein are largely concerned with the "continuous" type furnaces and incinerators.

The major components and functions of the modern plant and which are generally enclosed in a single building are:

a) Tipping floors: Usually an enclosed, roofed over area wherein the collection truckis weighed and maneuvered into position for end dumping the refuse over a backing log into the storage pit. This structure should be able to accommodate the daily truck peaks with clearances for the largest truck. It should have good dust control measures and have adequate lighting and ventilation.

b) Storage pit: This is a large, deep, generally depressed, box-like pit of water-tight concrete construction to hold refuse in amounts up to 36 hours burning capacity. This large capacity will help bridge over the usual 8-hour collection shift and permit a desirable mixing of the refuse in the interest of its more uniform consistency.

c) Cranes: The refuse from the depressed pit is raised by overhead monorail or preferably bridge-type cranes so as to discharge it near roof level into metal hoppers feeding the refuse by gravity through connecting chutes into the furnaces below. These chutes should preferably be equipped with shear gates to control possible backdrafts and backfires and should be cooled with water jackets.

d) Furnaces: These are large, box, sometimes cylindrical shaped, structures equipped with moving and agitating metal grates and lined inside with refractory and insulating brick so as to withstand the high burning temperatures. Here the refuse is detained from 30 to 45 minutes in order to effect a near-complete burning out of the combustibles at temperatures of 1500° to 1800° F. The travelling or reciprocating grates slowly advance the refuse to the discharge point at the same time stirring or stoking the refuse bed to promote a more complete burnout.

e) Residue System: The discharge from the furnace grates, comprised of ashes, tin cans, and other unburnable materials, is dropped onto suitable conveyors operating in long troughs and there quenched and cooled before dumping into trucks for conveyance to a landfill for final disposal.

f) Combustion Chambers: Extensions of the Furnace Chambers, and either a part thereof or as a separate component. Their function is to complete the burning out of the exhaust gases and suspended particulate material at about 1800° F. Like the furnaces they are built of refractory construction suitably hung from an appropriate steel frame.

g) Subsidence Chambers: These are secondary chambers with refractory and insulating linings. The burning and destruction of noxious gases and fine suspended matter are completed herein and then settled out and trapped to alleviate objectionable discharges into the atmosphere from the exhaust stacks. These chambers may be further equipped with water sprays and wet bottoms to further help in removing the noxious gases and the particulate matter.

h) Chimneys: High exhaust stacks, usually of brick construction which provide the natural draft required to supply the air of combustion in the furnaces and to facilitate dispersal of the exhaust smoke and gases into the atmosphere, usually at levels of 150 to 200 feet above ground level. Where high chimneys are objectionable they may be supplanted with a suitably designed induced draft system.

Disposal of refuse by incineration is inherently prompt, thorough and complete. Its putrefiable content in particular does not, as in some other disposal processes, take days and sometimes years for neutralization. The health hazards, odors and other nuisances can be either totally destroyed or at least largely alleviated by the high temperature burning. The refuse can be reduced to a relatively innocuous residue of a chemically stable, odorless character. The ability of incineration to process all but the bulkiest solid wastes is matched only by the sanitary fill method. The need for costly dual collections and multiple household containers is dispensed with and substantial economies in collections and disposal can be realized. Furthermore, when extensive landfill sites are unavailable or costly or distant, incineration with its shorter haul advantage, can be economically competitive with the equally sanitary and complete disposal by sanitary fill.

The major disadvantages of incineration are the higher initial costs of construction, generally higher costs of operation and maintenance, the greater skills required for efficient, nuisance-free operation, and finally the need for secondary disposal of the residue, about 12% to 15% by volume of mixed refuse, by landfilling.

The stated advantages, abetted in the last two decades by the phenomenal growth of urban communities with concurrent demands for nuisance-free operations and the need for overcoming ever higher labor costs have produced progressively improved designs and a substantial increase in mechanization. In essence the modern central incinerator is in the forefront of the most dependable and economic disposal methods for the large community.

A discussion on their historical background, basic design considerations, and construction and operating costs follows.

HISTORICAL BACKGROUND

The initial installations in this country, started in the late 1800's, were patterned on coal burning furnaces and generally handled rubbish only. Where garbage was incinerated the general practice required addition of coal at rates of one pound to eight pounds of garbage. One of the major justifications then used for installing rubbish incinerators was the utilization of waste heat and power generation. Most of these early efforts were abandoned due to operating difficulties and the undependability of waste heat production. In general, however, progressive improvements were made and implemented. Thus, in New York City a small rubbish incinerator was constructed on Governors Island in 1885. This was followed by the construction in 1903 of a small experimental rubbish burning plant which guided the design of two rubbish incinerators for Manhattan followed by the construction of four Dixon garbage incinerators for Queens in 1906. Increased knowledge was gained through the operation of these and other incinerators throughout the nation. Three 500 ton incinerators were opened in 1929 in New York City for burning mixed refuse. Their relative success triggered the construction in New York City of four more similar incinerators totalling 2,500 tons per day design capacity. Similar progress and developments were being made concurrently in the other major cities of this country and in Canada so that by 1930 the two nations accounted for over 250 plants, ranging in burning capacity up to 750 tons per day each.

The depression of the mid-1930's not only arrested new construction but forced many municipalities to shut down existing plants in favor of cheaper, even though less sanitary, disposal methods. The population explosion following World War II, the progressive increases in output of refuse, the build up of densely populated urban areas -- all coupled with a general era of prosperity again created a demand for incineration but to improved designs which would reduce the former operating nuisances and help to overcome the progressively increasing labor costs. This demand was well met through the cooperative efforts of the engineering profession and the manufacturers of incinerator components. The modern incinerator plants, numbering about 600 and with an estimated total rated capacity of about 150,000 T.P.D. in U.S.A. alone, are complex, highly mechanized, largely automated plants, with positive dust and litter controls, electrostatic or sprayed baffle fly-ash precipitators, induced draft fans and short exhaust stacks, and with buildings designed to high architectural standards. The progressive replacement of the former batch-type furnaces with the continuous, travelling grate equipped, furnaces - assuring uniform high temperature burning with the minimum of manual stoking - have helped to reduce operating costs. Concurrent improvements in refractories, metals, castings and other materials have generally decreased the maintenance costs in spite of the much higher sustained burning temperatures. The objectionable high stacks, the smoke, odors and litter, and the factory like buildings are no longer the trade mark of the contemporary incinerator. Whereas the old fashioned destructors were tolerated only in out-of-the-way sites, the modern plants are now frequently accepted in near-centrally located, built-up city areas.

Up to about 1930 the costs of incinerator operations were reduced in part through salvaging marketable products such as paper, rags, metals and even glass cullets. However, the replacement of these salvables by various new plastics and synthetics, the more ready and economic availability of primary paper fibers, the demand for better steels, and the increased costs of salvaging have, except for rare instances, eliminated reclamation operations in the newer plants.

DESIGN CONSIDERATIONS

In determining the design capacity of an incinerator consideration must be given to the following seven major items:

Plant's Objective - a matter of basic policy as to the thoroughness of burning to be accomplished. This can vary from the occasionally used short burning process to the more normal, near-complete burning. In the former only the most flamable components are burned out so as to reduce the volume of the refuse for final disposal to about 1/2 or 1/3 of its original volume. At the other extreme, a near complete burn-out of all combustibles reduces the volume requiring landfill disposal to about 1/10th of its original volume. The residue in this latter case is organically stable and nuisance free.

Type of Refuse to be Processed - again a matter of basic policy as to degree of separation to be practiced in collection. This can vary from collecting only combustible rubbish to the more practical system of collecting and processing all solid wastes without any separation. Since the design of most of the major incinerator elements is governed by the combustible portion only and only the storage and handling components are affected by including the non-combustibles, it can be demonstrated that the non-segregated (except for ashes) collection system is the most practical and economical.

Amortized Life - usually 40 to 50 years for the structure and 10 to 15 years for the incinerator equipment. Within these time limits plant capacities must be capable of accommodating changes in population, per capita refuse output, and character of refuse.

Number of Plants - except for the very large cities a single plant will usually be more practical and economical. On the other hand, the single over-large plant may require costlier truck haulage of refuse and residue, may discharge such large amounts of gas pollutants as to be beyond nature's ability to disseminate and absorb, and may require such large furnaces and auxiliaries that their outages (for repairs or maintenance) would have an adverse effect on well managed operations.

Daily and Seasonal Variations in Refuse Output - these will range from 85% to 115% of the median and must be taken into consideration either by providing a design capacity to the upper limit or by making suitable provisions for disposing partially burned residue.

Operating Shifts - obviously the number of shifts (1, 2 or 3 per 24-hrs.) and the number of working days per week (5, 6 or 7) will have a major effect on overall plant capacity. The continuously operating, round-the-clock plant will generally be more economical both as to capital and operating costs.

Plant Operating Factor - experience shows that substantial operating capabilities will at best be from 80% to 85% of theoretical rated capacity. The design capacity must be upped accordingly.

COSTS

Construction Costs - These will vary with: 1) the current local cost index, 2) type of refuse processed, 3) types and extent of building enclosures, 4) types of furnaces and auxiliaries, 5) peculiarities of site preparation and of foundations, 6) extent of standby facilities built-in, and 7) various design refinements built-in for purposes of reducing operating and maintenance costs.

Total construction costs for well designed plants, exclusive of site aquisition and engineering, range from $3,000 to $5,500 per ton of design capacity, depending on the aforementioned conditions. A typical division of construction costs, by general functions, for a large modern incinerator of the costlier type is shown in Table 1.

Operating Costs - These will vary with local conditions as to: 1) type of labor used, their wage scales and productivity, 2) type of refuse processed (combustibles only vs. mixed refuse), 3) degree of incineration - partial or complete burning, 4) type of incinerator - batch vs. continuous, 5) degree of automation, 6) number of 8-hour shifts worked per week - from 5 to 21, 7) degree of nuisance controls as to odor, dust, air pollution, etc., 8) type of residue disposal, 9) the type and degree of maintenance required by the given design, 10) cost of utilities used - water, gas, electricity, telephone, 11) costs of administration.

Most published reports on operating costs are misleading inasmuch as they are usually based on either incomplete or short-lived records. A sampling of recently reported reliable costs shows that total operating costs per ton of refuse processed range from about $3.50 to $5.00, including amortization. A 1960 detailed breakdown of the total operating costs averaged for five modern, continuous type incinerators, is shown in Table 2.

NEED FOR FURTHER IMPROVEMENTS

Notwithstanding the substantial improvements made in the last 10 or 15 years, incineration of refuse still needs further study and development in a number of critical areas to place it on a par with power plant operation as to efficiency, dependability, cleanliness and freedom from nuisances. Some of the major critical areas include 1) better dust control for improved housekeeping, 2) reducing over-large refuse components to handleable sizes, 3) improved controls of secondary air, 4) preheating air of combustion, 5) utilization of waste heat, 6) more effective grate designs, and 7) alleviating air pollution by improved scrubbing and cleansing of exhaust gases.

SUMMARY

Well designed and operated incinerators:

1) Possess the required flexibility of operation to adjust

themselves to the ever varying quantity and character of refuse.

2) Can handle all solid wastes without need for segregation and resort to secondary methods of disposal.

3) Can be operated with the minimum of nuisances and health hazards.

TABLE 1

DISTRIBUTION OF CONSTRUCTION COSTS FOR EQUIPMENT AND BUILDING (BY FUNCTION) PER TON-DAY

(1958 Cost Index)

	Architectural & Structural $	Mechanical $	Electrical $	H & V Plumbing & Misc. $	Total Cost $	Per-cent of Total $
Delivery of Refuse (Tipping Floor, Scales and Accessories)	337.	4.	14.	18.	373.	8%
Handling of Refuse (Storage Pit, Cranes, Hoppers & Accessories)	658.	141.	14.	27.	840.	17%
Burning of Refuse (Furnaces, Flues, Chimneys, Combustion Chamber, and Accessories)	955.	1,321	121.	55.	2,452.	51%
Residue Removal (Ash Cellar, Conveyors, Controls & Accessories)	309.	108.	66.	41.	524.	11%
Fly Ash Removal (Subsidence Chambers, Screens and Accessories)	113.	15.	9.	9.	146.	3%
Miscellaneous Utilities, Grading, Landscaping, Demolition, Furniture, Tools)	313.	127.	30.	16.	486.	10%
Total Costs	2,685.	1,716.	254.	166.	4,821.	100%
Per Cent Distribution	55%	36%	5%	4%	100%	

TABLE 2

COST OF REFUSE DISPOSAL BY INCINERATION

Unit Costs per ton of Refuse Processed
(1960 Cost Index)

	Continuous Type (5 Plants)
DIRECT COSTS	
Operating Labor (Cranemen, firemen, stationary engineers, laborers)	$ 2.20
Maintenance Labor (Masons, mechanics, laborers)	.13
Residue & fly ash disposal:	
Hauling to sanitary landfills (average 5 miles)	.21
Landfilling disposal operations	.53
Overhead & Administration (departmental only)	.25
Total Direct Costs	$ 3.32
INDIRECT COSTS	
Fringe Benefits (pensions, vacations, sick leave)	.72
Vehicle Maintenance (residue loading & hauling vehicles)	.08
Utilities (telephone, electricity, gas, no water or sewerage charge)	.07
Materials & Supplies (for operation & maintenance)	.09
Capital Amortization @ 3% (45 yr. life for plant & 15 yr. life for incinerator equipment)	.71
Total Indirect Costs	$ 1.67
TOTAL OPERATING COST PER TON PROCESSED	$ 5.00

INCINERATION PANEL

Messrs. Michaels, Rogus, Novick, and Wunderle

MR. MICHAELS: Thank you, Cass. We all appreciate the fine effort that went into this fine preparation, the expense you went to to get these fine pictures for us.

Later on, I hope we will have an opportunity to question you about some of the European practices as well as some of your American experiences.

Before I go further, I would like to introduce the rest of your panel for this afternoon. The first person on my left is Jack Wunderle, air pollution engineer of the Ohio Health Department. Next to him is Robert Novick, Public Health Service, Chicago.

As I said, Cass Rogus took care of most of the basic presentation on the subject of incineration. I think I will add a little to it.

Incineration, by definition, is really a chemical process, an oxidation process which takes place in the presence of heat. It can further be defined on the basis of its use or service. The incinerators that you saw on the screen were essentially municipal plants. There are also private incinerators which serve the same function and are built pretty much the same way as municipal plants. These two are categorized as central incinerators.

Then there are the on-site incinerators which are the apartment house incinerators and the small home units, either the backyard can type or the more sophisticated gas-fired unit which is installed in the home or in an apartment house.

The on-site units are important from a public health standpoint, and from an air pollution standpoint. Perhaps the most important consideration there is the fact that they are operated invariably by the housewife or the janitor or a person who does not appreciate the public health aspects of waste disposal, so that they are generally frowned upon by the public health agencies in government.

On the other hand, the municipal official who is responsible for refuse disposal, refuse collection, welcomes the assistance he gets in solving his problem by the use of these on-site incinerators, so those of us, like Cass and myself, who have a job to do getting rid of material, look to improvements in on-site incinerators so that they will become acceptable to those of you who are concerned with the health problems related to the disposal of solid waste. I guess primarily the greatest objection to them is the emissions which pollute the air, the noxious gases, the particulates that these poorly operated incinerators produce.

Incineration is a chemical process. It is a combustion process, but unlike most processes, the purpose is not to produce heat and not to produce a useful product, but the main purpose is to get rid of something, and as such, it is sort of unique in the process industry, or in the combustion industry. This has to be recognized in designing incinerators.

Of course, there are some plants, particularly in Europe, that utilize refuse as fuel. When you do that, your approach to the disposal problem is somewhat different from what it is in most communities here in the United States, which is not necessarily to utilize the refuse, but to get rid of it and to get rid of it in a healthful manner.

In determining what design considerations should be examined when one sets out to design an incinerator, you first have to understand what the quantity of refuse is that you are dealing with, the type, and what it is made of. Often, you have to examine the refuse collection practice in the communities to be served. In some communities, there is separation, separating the noncombustibles from the combustibles. Glass and tin cans may be handled separately, may be stored on the site separately, and as such are not part of the refuse which must be incinerated. In others, the garbage is excluded.

I am sure you have heard about the variations in refuse stored and refuse collection practices yesterday. The important thing to remember is that if you are to design an incinerator, you must appreciate that there will be differences in the characteristics of the refuse based on location, based on practice, based on the degree of service offered by the community such as collection service, primarily for residents, or collection service for commercial establishments as well as residential establishments.

Here we recognize that you have to know how much material you have to handle and what this is made of.

The major chemical characteristic of refuse which determines the size of the units which form the incinerator plant is the BTU value of it. These values here in the United States today probably vary from 3500 BTU's up to 5500 BTU's per pound. Before you can start designing a plant, you must make a determination as to what this BTU value is, not necessarily to limit this figure to the current value, but attempt to forecast future values.

I think our experience here in the United States has been -- at least in the past ten or fifteen years -- that there has been a considerable increase in the BTU value of refuse. This has come about for several reasons. One of them is the reduction in the amount of coal which is used for home heating and this has reduced the ash content of refuse.

Another one is the change in food packaging which has reduced the moisture content by reducing the amount of food waste that is placed in the refuse can by the homeowner.

Perhaps the change from paper and metal and glass containers to plastic has increased the BTU value, also.

This change works in two directions, incidentally. The plastic container is much lighter in weight than the other containers, but it has a higher BTU value. My own experience so far has been that there has been no serious effect on our operations in Philadelphia as a result of the obvious increase in the amount of plastics in our refuse. This could change as packaging practices change.

Starting with your BTU value, you will determine furnace size, grate size, and air requirements.

In relation to municipal refuse, I guess the Refuse Disposal Practice Manual prepared by the American Public Works Association is probably one of the best sources of information as to the characteristics of refuse and as to the design criteria to be used. This is not a technical publication, but it does have some good figures in it.

The grate loading on a refuse furnace is designed to meet a 300,000 BTU per square foot per hour loading. If you designed your grate for that figure, you will find that the size is generally comparable to the sizes used on successful incinerators today. The theoretical figure of 20,000 BTU's per pound of refuse per square foot or per cubic foot of furnace volume, on the other hand, is not a suitable figure primarily, apparently, because of the variation in the characteristics of refuse. For that reason, a lower figure which gives you a lower furnace volume is recommended. This is 12,500 BTU's per pound per square foot.

Air requirements. These are generally determined by the BTU requirement, again. Generally, for incinerators, this figure is for basic burning, six and a half pounds of air per pound of refuse except, again, recognizing that the fuel is not homogeneous. We have found that twice this figure, or a hundred per cent excess air, or somewhere around thirteen pounds of air per pound of fuel is a good design figure. We have tested some of our plants and found that we have gone well beyond that in many instances, up to 200 and 250 per cent, and on occasion up to 300 per cent excess air. This is not required, necessarily, but the ability to design an incinerator which will be controllable to the extent that all of the air introduced is actually used for combustion has not yet been developed, at least not here in the states. I think if we have a chance, Cass Rogus may tell us about some of the air requirements used in Europe, and I think they come well below that, somewhere between 50 per cent and 100 per cent excess air. Of course, there, again, they are trying to conserve and utilize the heat in the instances where they are producing waste heat.

The subject of refractories is one which is extremely important in incinerators and has too often been overlooked by designers. It is something which people in the operating field have, I believe, generally more knowledge.

The refractory problem comes about as a result of the introduction of these large quantities of air, for example, which has a tendency to result in fluctuating temperatures, as well as the abrasion produced by the movement of refuse within enclosed refractory lined areas which will often cause an erosive effect on the side of a furnace if the proper refractory is not used.

In areas where water is used for cooling or for fly ash control purposes, here, again, you will find that special refractories -- I shouldn't say special refractories, but refractories which can exist in atmospheres which at times are hot and dry and at other times are damp and cool are desirable. I don't know that there is any one good refractory for all furnaces, for all incinerators. As a matter of fact, in our newest plant, we have used four different types of refractories. We have used silicon carbide, for example, above the grate line because this is a very hard material which resists slag and resists erosion. This is the portion of the furnace which is actually exposed to the erosion action of the material, or at least is exposed to contact with the refuse as it moves along the grate.

Above that, we use high alumina brick. This is something we have experimented with for a number of years. This is fairly expensive, but here, again, we find it has much greater slag resistance than refractory materials which have been used extensively in the past.

Then, when we get out of the high erosion area, the high slagging areas, we use a hard burned super duty brick which will provide adequate service, which is not nearly as expensive as the first two bricks mentioned, and which will last certainly as long as the other two, primarily because they are located outside these problem areas.

Then, once outside the furnace, a good quality super duty brick will do the job. Then, when you get into such things as chimneys, you may find that just a regular high quality fire brick would be adequate. That is, if you think you need refractory chimneys.

Residue handling systems. Cass has touched on these. He showed you the conveyor system with the quench trough, the wash tunnel, I think we also saw a picture of that in one of his shots. We have used a new system with some degree of success, using residue containers for a plant which has a fairly tight combustion system.

There is a gateway which is kept closed except when the material is dumped into the container. When the material is dumped into a container, a shroud is lowered which provides a continuation of the air shield within the furnace, but I would say that as of now, there is still no real good residue handling method in use here in the states.

Instrumentation. Certainly the European practice indicates that a lot of instrumentation can go into an incinerator plant, particularly when they are used not only for the disposal of refuse, but also for the production of steam. You really have to instrument this thing as you would a boiler plant. However, when you design less sophisticated plants, there may be some question about just how much instrumentation is required.

One thing you should be certain of, and that is that you have adequate maintenance of the instruments. I have seen more plants with improperly maintained instruments than I have with properly maintained instruments, and this covers a good deal of the countryside. This, by the way, is also one of the reasons that our incinerators here in this country are not operated as well as they should be because either improper instruments are installed initially, or if the right ones are installed and not properly maintained, the people are not aware, or not willing to operate as they should operate.

You have heard something about the question of shift operations at plants and its effect on cost. The cost effect is not just an operating cost effect, and, incidentally, some recent studies have revealed that operating costs of a plant that runs three shifts a day, that is continuously for twenty-four hours a day, are somewhere under one-half the cost of operating a similar installation on an eight-hour basis. This recognizes the very important factor of initial cost which is there, regardless of how much you make of the plant.

Plants should be designed with proper ventilation. This is another factor which is often overlooked. Those of you who have had opportunities to visit incinerators, particularly in the winter months, may have experienced some difficulty opening the door to what is commonly called the operating or burning floor because, invariably, the combustion air is taken from this operating floor and, of course, in winter months, the personnel are loathe to open these doors or windows and permit this air to come in, with the result that there is a negative pressure within the building. Furnaces are actually being starved for air and poor combustion takes place, so in designing the plant, examine this problem of plant ventilation. We find that it is best to actually take air from outside the plant itself.

Efforts have been made, incidentally, to take air from over the pit area on the theory that there is a certain amount of odor produced in the pit, as there may well be, and ventilating the pit at the same time you are providing combustion air seems like a good idea, but our experience has been that there is always a tendency to clog up the intake to the duct work going from over the pit into the furnaces which result, eventually, in the abandonment of the use of this method of ventilation. In fact, the odor of refuse tends to stay confined within the place itself. I have yet to know that I am approaching an incinerator by the pit odor. I may recognize it by the stack discharge odor, but there is a distinctive difference between the two. I haven't heard of any incidents where there have been complaints as a result of pit odor. I suppose this could happen, but with the well operated plant, it shouldn't and won't, and trying to solve your ventilation problem and your pit odor problem at the same time with the same device doesn't work out well.

You have heard some information about the economics of incineration plant costs. Cass Rogus said $3000 to $5500 per ton for initial capital cost was about right. I am pretty sure that he has a plant in New York that went well over that. We have a new plant in Philadelphia that is handling 600 tons per day and it cost us about four million dollars. This thing, I think, is $6667 per ton.

A major part of this cost, incidentally, is for the site preparation. This plant is located on a river. There is perhaps a million dollars worth of piling and pile cap, and concrete platform work which would probably not be part of an installation located on dry land, but I think we can up this $5500 figure and say that it is safe to say that plants can easily cost as much as $6000 to $6500 per ton of capacity.

Operating costs. The larger the plant, the lower the operating cost. That is a good guide, but the size alone is only one factor. Continuous feed plants invariably are a lot less expensive to operate, though perhaps more expensive to build initially.

This matter of salvage practices, waste heat utilization, is very interesting. Waste heat salvage is a good idea and should be investigated any time a plant is designed, but it should be investigated very objectively because the cost of providing a waste heat boiler and a man and the equipment required to run it will not pay for the saving in steam or electricity produced within the plant itself. I think it is safe to say there must be a need outside the plant to justify the installation of a waste heat unit in an incinerator.

The city of Chicago has a contract with their local power company to produce steam at a fairly good price. I think it is somewhere around 65 or 66 cents per thousand pounds of steam delivered at the plant. I don't know what the exact conditions are. My guess is that they can produce this for perhaps half that price, so that they have an installation that should pay off. They fortunately were located right next to a main steam line and there was no significant expense involved in connecting the plant steam outlet to the steam line.

We studied this for the four million dollar plant of ours. We had a similar situation, a steam main a mile away from our plant. This was just enough to balance any possible income to the city. It would have cost us just as much to install this mile of steam line as we could hope to gain in the sale of steam. It can be done. You can sell a waste heat product, but you have to have a customer for it and there has to be a need for it.

Residue, on the other hand, has some value, is being sold at the present time. Again, in Chicago, some plants in Texas, the city of Miami, Florida, the city of Atlanta, Georgia, are selling residues. These plants are selling the tin cans from their residue.

I think that they might be able to show an economic gain from this. I am not sure. As Cass said, it is difficult to get all the figures, all the cost figures in any kind of a municipal analysis. I find it is often desirable to juggle figures myself, so I think you have to recognize that, or at least, take the figures of this kind with a grain of salt.

I hope that one of our panel members this afternoon will elaborate a little bit on the value of residue.

How do we stand today? What is happening in the field of incineration? There are improvements. There are changes being made primarily because the demand is growing. There is no economic reason for industry as well as municipal government to concern itself with the cost of incineration. The public health aspect is becoming increasingly important, first, because air pollution becomes recognized as a serious health problem or potentially as a serious health problem, and now as land pollution is becoming recognized as a potential health problem.

The residue from an incinerator, although perhaps inert, perhaps free of organics -- and this can be done pretty much with a good plant, properly operating, but it still contains chemicals, and these chemicals could cause chemical pollution of underground waters, so there is a need for improvement that did not exist fifteen or twenty years ago, and for that reason, we have a meeting like this. For that reason, we have had throughout the country meetings to determine the research needs in the field of solid waste. This is showing up in actual plants that have been constructed over the last few years.

Those of you who have read any of the history of incineration will know that back in the thirties, particularly, there were more incinerators that were built and not in use than there were in use. This was for economic reasons, and for health reasons. There has been a drastic change. A plant built today is generally used. It is seldom that you hear of a plant that is given up, that doesn't work to the extent that it doesn't pay to try to fix it.

There have been some attempts by some pretty good companies to try to move into the incinerator field, not with much success. Probably most of you know of the Dravo effort in White Marsh, Pennsylvania, where there is a very extensive project being conducted by this rather large manufacturing company out of Pittsburgh. They are trying to develop a package plant design which will solve the problem of this particular township. It was a water wall plant, using a continuous feed stoker, using a vibrating pan storage and feeding device, and a very high quality scrubber, a Peabody scrubber, which theoretically, at least, removes 95 per cent or more of the particulates.

This plant failed after several valiant attempts to correct some of the problem conditions. However, they haven't given up on it. There is a contract underway now to change it. They may end up spending as much changing the thing as the original installation cost, but this is an indication of the change that has taken place. Incineration is needed. Improvements are needed. Big companies are interested.

The Allis-Chalmers Company, I believe, has developed a plant which they hope will be salable to the general public.

The concept of package plants or -- well, designs by a single company, I don't think is the best approach, particularly. This is a treatment problem, a process problem that compares with other combustion processes or chemical processes, or perhaps in the municipal field, for sewage and water treatment. Sure there are package plants, package sewage plants and water plants for installation. They work and do a good job, but each community -- each large community has its own unique problems. The refuse they collect is varied. This variation should be recognized, even if it means a difference in size of grate or combustion chamber, but this is important and for that reason I think most of us in this field feel that individual design is important, if not essential, for municipal incineration.

There has been a certain amount of research done in the field of incineration, not as much as we had hoped would be done, but this, too, is changing. The important area of research has been in the field of air pollution, primarily. Cincinnati Center, the Taft Center down in Cincinnati has done a lot of work on over fired, under fired relationship as it affects air pollution, but this is only a part of the problem. You can't ignore the effect of varying over firing and under firing and the control of air quantities on the residue.

We have run some tests at our plant -- I am going to show you pictures of our northwest incinerator later. We ran some air pollution tests on that which revealed some very interesting results. We have a certain amount of flexibility at that plant. We vary over fire-under fire air to some extent. We could get almost as much as 50 per cent air over fire, and we did take air pollution samples for what could be considered our normal operation which is something like 75 to 80 per cent air under the grate and 20 or 25 per cent air over the grate. In this plant, we collected the fly ash samples. This is just the stuff that got out of the plant, actually beyond the fly ash collectors. We analyzed this and found that under the conditions, we still had somewhere between 25 to 30 per cent organic material in the fly ash that got out of the plant. This means that we did not burn all the particles that we could have or should have burned, but then when we increased the over fire portion of the air to close to 50 per cent, this unburned or organic discharge went up to somewhere around 55 per cent, so you see if we had a 55 per cent organics going up the stack as opposed to 25 or 30 per cent, we obviously are getting a poorer burn-out at the grate itself, so the residue would not be as good.

Now, we had no way of adequately testing the residue at the time, so we didn't do it. Since then, we have become part of what I think is a fairly important incineration project and that is to analyze incinerator residue, determine what standard can be used to define residue, and then from the health standpoint, establish good standards.

I left out one important thing that has to do with this matter of design. It is not something that relates to the incinerator itself, but it has to do with the overall problem of refuse disposal. When you incinerate, you end up with a solid residue. This residue has to be disposed of. Perhaps some day we can find the residue is usable, in which event you will have no disposal problem, but as of now there is a residue which will vary in quantity from 5 to 15 per cent by volume, or from 20 to as much as 40 per cent by weight, depending primarily on how much noncombustible material you have going into the furnace in the first place.

Since this has to be disposed of, it means that there must be a disposal site available.

Now, in designing incinerators, people will often say, "Well, we have to design standby facilities." Certainly you do. An incinerator, perhaps worse than most plants, has a tendency to break down, but in designing standby incinerators, don't ignore the fact that there obviously has to be landfill space available for the residue, and you may find that you can invest more in a basic plant with a minimum amount of standby capacity if you have adequate space available for landfilling. In other words, don't approach the incinerator problem as a total disposal problem, one which has to stand on its own two feet. Recognize that you must have something else beside that.

In conclusion, the most important thing to remember is that when you design a plant, you are designing it to produce acceptable effluent from a health standpoint. These are air pollution effluents, residue, and if you use water for part of the process, primarily, say for cooling, or air pollution control, make certain that you have provided for treatment of this water because, surprisingly, it varies considerably in chemical content. We have had readings of pH that have gone down under 3 and up over 11, though we could come up with an average and the average, I think, is slightly alkaline, but the variation is there.

For a plant that does not do too good a job of burning, you are going to get a certain amount of other contaminants and in the residue you will get BOD readings that may be on the high side. Make sure that you provide for all three of the effluents that come out of the plant.

I will show you these pictures of the Philadelphia northwest incinerator.

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This plant was built back in 1959, and has been operating pretty continuously since then. It is a 600-ton plant, and we have been averaging slightly over 600 tons a day ever since the plant has been in operation. This is with shutdowns for maintenance, repairs, and things of that nature.

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This is what we feel is perhaps the best kind of site to build an incinerator. It was a real nuisance to start with. It was an open burning dump. Neighbors very often are upset at the fact that you are building a disposal facility near you. If you can find something like this to build on, they will be happy to see the change.

You may have noticed in the pictures that Cass showed you of the Betsy Avenue plant, right near the bottom, he had a lot of head spin on his air. That is also a good place to build. Very little resistance.

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Certainly you have to start out with good engineering studies. There is no reason why you should not call upon reputable manufacturers to help you in your design. There are people outside of the consulting engineering field who are competent. The right way, of course, to start, is to study the problem thoroughly.

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This is a little more than a schematic, but is a cross-section. In planning, this is a T-shaped plant with two large pits, one on either side. It is a 600-ton plant. It has 1000 tons of storage capacity. It means we can collect refuse five days a week and burn six days, which we have very often done. It is a continuous traveling grate plant without a separate combustion chamber. The furnace is designed with adequate combustion space and a certain amount of over fire air to help mixing.

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This is the new plant I mentioned a little while ago which cost us so much money. It has the same furnace configuration except that we have introduced considerably more elaborate over fire equipment, one which will enable us to introduce better than 50 per cent of our air over the grates at high and low pressure. The high pressure is to insure adequate mixing. We have high pressure jets going into this thing at 20 inches of water pressure which is quite high. Then, coming out of the furnace, the orange-colored area, the sort of lacework thing at the throat there, that is where we introduce cooling water. The cooling chamber, as you see, has an air cooled baffle in it. We introduce air in the cooling chamber, again, to provide adequate mixing. This goes into a cyclone collector through induced draft fans up a metal stack.

Down below you see the containers that I had mentioned earlier.

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This is the plant under construction. This plant, incidentally, cost $4000 per ton primarily because of its physical location. This is built right up into an old quarry so that we had an ideal setup for a continuous gravity type process system starting up on the top end, plenty of space for the big storage pit, and on the lefthand side there you see part of the cyclone collectors going in.

We like metal stacks. Here you see the two stacks completely present, assembled on the lefthand side, ready to be hoisted into place. They happen to be glass lined stacks. Unfortunately, they are not made anymore, but after five and a half, almost six years of operation at better than design capacity continuously, we have had practically no maintenance on the stacks and the insides look almost as good as the day they were installed.

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This is, believe it or not, the next day. Both the stacks were installed in one day. As you see, we take pains to provide attractive plants, too. They don't have to look ugly. They can look good.

... Slide ...

This is a picture looking into the furnace before the traveling grates are installed, but with all the furnace steel erected. We are looking in from the charging end of the furnace, and here you can very easily see just what furnace steel structure looks like for this particular type plant.

The horizontal rust colored members there are part of the brickwork supporting structure.

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Here we see the grates installed and the hangers for the refractory brick installed on those horizontal members that you saw earlier.

... Slide ...

This isn't too good a picture, but it is one that you seldom have an opportunity to see. This is the silicon carbide wall going in. We have what we feel is a real good design. I don't know if you could see the line of holes up near the top of the wall, but these are discharge holes for the air cooling which is used to reduce the oxidation and, consequently, the growth of silicon carbide. If you specify silicon carbide for an installation, make sure that you provide adequate cooling because this material has a tendency to grow and, sturdy as it is, it is liable to actually move steel as it grows.

... Slide ...

This is the outside, the insulated brick portion of that same silicon carbide wall, and this duct that you see coming out there is an over fire air cooling duct. It is not the duct which is used for wall cooling. There are two different sets of ducts. The one sticking out is for over fire use. The hole down below is for wall cooling.

. . . Slide . . .

This shows a hung wall in the process of installation. For high walls, generally even for medium sized walls, hung construction is generally less expensive and certainly a lot easier from the maintenance standpoint. If you have to replace any of this, all you do is remove the portions which need replacement and set new brick right back on the same hangers, as opposed to removing entire sections of bearing walls.

. . . Slide . . .

The cooling chamber that you may recall seeing in the sketch was made of castable material. These are the hangers. This, incidentally, is a 40-foot high castable wall. Many people say it would fall down. It is still there after over five years of service and the kind of atmosphere that I described as being rather difficult to serve, and that is an atmosphere which is sometimes wet and sometimes hot and dry.

. . . Slide . . .

This is the same wall with the castable installed. Those louvres that you see up there are going to make you feel that you are looking out of a prison cell, I guess. The louvres up there were specially installed to provide additional air if we were to operate at less than capacity, to insure adequate flow through the cyclone collectors which is a requirement if you are to maintain efficiency.

As I mentioned, we never do operate at under capacity, so we just seal these up because they are not required.

. . . Slide . . .

This is a rather poor picture. This is what the cyclones, the under side of the cyclones, the cyclone collectors, look like. This is the end that the collected fly ash drops out of into a large hopper underneath.

. . . Slide . . .

Here are the plants completed. You see our trucks anxiously waiting to come and serve.

. . . Slide . . .

This is that important lighting of the single match that starts this big fire going.

... Slide ...

Though perhaps not quite as elaborate and sophisticated as the European plants, this is a fairly good panel board, one that serves a very useful purpose and includes right now -- I am unhappy to say -- on the lefthand side a smoke indicator which shows a reading at this moment of just over one on the Ringelman chart. Usually we are on the lefthand side of that one, but sometimes we go above it.

... Slide ...

Actually, there is only one way to determine whether a design is good and that is to test it. This is the test apparatus used to test the stack.

... Slide ...

As I said, I think we could design fairly attractive looking plants. That is the northwest plant, glazed brick, expensive initially, darned easy to maintain, just take a hose and wash it down. All that glass over the light area just washes down very easily. There are short stacks over there. We don't do a good job of erasing the smoke. I still see some signs. We don't get it all.

That is it. Thank you.

... Short recess ...

MR. MICHAELS: We are ready to resume the session on INCINERATION. Our next speaker is Mr. Jack Wunderle, engineer for the Air Pollution Unit of the Ohio State Department of Health. He will speak to us about the air pollution aspects of incineration.

MR. WUNDERLE: As I sat there, I thought how wonderful the human mind is. It starts to work when you are born and it never stops until you get up to make a speech.

... Mr. Wunderle presented his prepared paper ...

AIR POLLUTION ASPECTS OF INCINERATION

By Jack Wunderle,
Air Pollution Control Engineer,
Ohio Department of Health,
Columbus, Ohio

A few decades ago there were only two reasons for no smoke from the chimney of a factory - either times were bad, or it was Sunday. But times have changed, and what was once a symbol of prosperity is now at best - a nuisance.

There is every reason for us to be as concerned about the purity of the air we inhale as we are about the safety of the water and milk we drink and the cleanliness of the food we eat. Of all the basic physical necessities of life, air assumes top priority. Man needs an average of only 4-1/2 pounds of water and 2-3/4 pounds of food to sustain him daily. But to keep the flame of life burning he must have at least 30 pounds of air, day in and day out. While it is sometimes possible to detect and reject contaminated food and water by its odor or appearance, we have no choice about air. Although it may be laden with "aerial refuse" we must inhale it as it comes to us.

Few people realize how dependent we are on the atmosphere to remove the waste products of civilization. Comparison of the magnitude of solid, liquid and gaseous wastes from a large metropolitan area is revealing. The total dry weight of solids removed via the liquid route averages no more than .55 lbs. per capita per day. Solid wastes, collected in the form of garbage, combustible material and non-combustibles averages 1.7 lbs. per capita per day. Gaseous wastes - hydrocarbons, oxides of nitrogen and sulfur, carbon monoxide, organic gases and aerosols - amount to 3.3 lbs. per capita per day. It is apparent that wastes removed by the gaseous route are six times that removed by the liquid route and twice that by refuse disposal.

In brief outline, the problem we face today is this. People and sources of pollution tend to concentrate in the same places. These sources are many and varied and are derived from our expanding needs for transportation of ourselves and our goods, from industrial and from commercial, municipal and domestic activities. Our technological and scientific progress brings about new kinds of pollutants which are added to the old. At the same time, population and urbanization are increasing.

Since 1940 our urban population has almost trebled, our use of energy has increased four-fold. One-half of our population in this country is concentrated on one per cent of the land area.

While these and other similar trends of contemporary life continue to rise, one critical factor, the available supply of air, remains constant. The more we concentrate our population into small portions of the total land mass, the less of the total air mass we have available for our use.

All of our industry from the largest steel mill to the smallest fabricator produce some contaminant that is eventually vented to the air. All of our combustion sources from the largest power plant to the smallest power lawn mower vent some contaminant. Any one source by itself might not be too objectionable, but the aggregate pollutants become a serious problem affecting health and pocketbook.

The effects of air pollution may be of an economic, nuisance or health hazardous nature. Particulate matter seeps into buildings to soil walls, curtains and furnishings, discolors brick, paint and stone of buildings. This particulate matter may damage vegetation through interference of life processes, cause disease in cattle by disposition and uptake in foraging plants consumed by the cattle - or if suspended in the air - give some areas an almost perpetual haze-reducing visibility and necessitating the use of artificial lighting in daylight hours. It has been estimated that if all the particulate matter that falls out of the atmosphere in the U. S. in one year were formed into bricks it would be possible to construct 400,000 homes 25 feet in width and 60 feet in length.

Acid gases such as sulfur dioxide and nitrogen oxides - when combined with rain, dew or high humidity corrode metals, building materials, textiles, papers, discolor paint, destroy, stunt or negate the growth of vegetable and fruit crops and ornamental shrubbery. The city official, the business man and the realtor speak of decreased property values due to the dirt, grime, corrosion or odor nuisance of air pollution. There is no way to measure the erosion of civic and personal pride and sense of well being caused by air pollution.

Total evaluation of the economic effects of air pollution is difficult. Even the most conservative estimates attribute economic losses due to air pollution in the billions of dollars annually. Estimates of economic losses range from $60 - $200 per year per person. New York City officials estimate the economic loss in that city alone as 520 million per year.

It has taken a number of air pollution disasters to convince us that pure air is by no means a limitless resource and that there are measurable health effects. Acute health effects from air pollution caused 22 deaths in Poza Rica in 1950, 20 deaths in Donora in 1948, 63 deaths in the Meuse Valley in 1930, and 4000 deaths in London in 1952. Temporary health effects from air pollution are quite common. The eye irritation from photochemical smog seems to do no permanent damage to the eyes and is classified as a nuisance. The red-eyed pedestrian in Los Angeles on a good smog day will find little solace in this classification and he may be rather emphatic in his disagreement with the statement.

Of even more significance are the long term health effects of breathing ordinary levels of polluted air day and night for years on end. Long term exposure to air pollution has been associated with many important chronic respiratory diseases - asthma, bronchitis, emphysema, and lung cancer. That we need to know more about the role of air pollution in the development of disease is clear, but that we know enough now to move vigorously to control the sources of the problem is equally clear.

Cleaner air is an established need in most cities. The citizen expects the air he breathes to be wholesome just as he expects pure water from the faucets in his home. For this reason, increasing attention is being given to the design and operation of refuse incinerators in order that they may comply with local air pollution control regulations. Many comprehensive community surveys have established that the total air pollution from space heating and refuse disposal sources are a relatively large percentage of the total burden placed upon the atmosphere in a community.

Incineration - to be effective from an air pollution standpoint - must achieve: Both maximum combustion efficiency in order to reduce atmospheric discharge of smoke, tars, malodorous compounds, and other products of incomplete combustion; and maximum retention of the incombustible solids in order to minimize fly ash and other solid discharges to the atmosphere. Incinerators are often charged at varying rates with heterogeneous materials of varying composition and with corresponding variations in combustion air flow rate and air distribution. Unless the incinerator is able to accommodate these wide ranges in operating characteristics and is operated properly, excessive atmospheric contaminants will be discharged.

Pollutants capable of causing health nuisance and economic effects may be emitted from incineration operations. Some of the possible emissions from incinerators are particulate matter (fly ash), aldehydes, benzopyrene, carbon monoxide, hydrocarbons, oxides of nitrogen and sulfur, ammonia, organic acids. For most of these contaminants - with the exception of fly ash or particulate matter - no air quality or emission standards of wide acceptance have been set up by municipal or state regulatory agencies. As regards particulates - the most used standard is that set forth by ASME model smoke ordinance - .85#/1000# of flue gases adjusted to 12% CO_2. Municipal incinerators operated with forced draft air at rated capacity and without benefit of fly ash collection systems have exit dust loadings in the range of 1.3 to 3.00#/1000# flue gas. This is roughly equivalent to 10 to 26#/ton of charge. Various types of incineration,as one would suspect, produce varying amounts of emitted pollutants - single chamber incinerators emit 20 - 25#/ton burned; multiple chamber - 4 to 12# /ton burned; a burning dump 47#/ton burned; and backyard burning 150#/ton burned. In most cities the major offenders - dump and backyard burning - are eliminated by a legislative ban of all open burning. Most incinerators, particularly the single chamber type, cannot meet the ASME recommended fly ash limitations by using dry fly ash collection systems alone, and therefore require special fly ash removal equipment. Furthermore, the trend in regulatory codes is to much stricter limitation - on the order of .35 to .50#/1000# of flue gas. In Cleveland, Ohio, the standard is now .2#/1000# of flue gases. Widespread acceptance of such standards will make imperative the use of secondary, high efficiency type air pollution control equipment to control emissions from incinerator operations.

Stringent abatement control may necessitate the use of water sprays to control dust and odors at refuse storage bins, of afterburners to insure gaseous pollutant destruction, and of high efficiency centrifugal, wet dynamic and possibly electrostatic precipitation devices to control particulate emissions.

MR. MICHAELS: Thank you, Jack. You did a lot of good and gave us some important figures. I think perhaps there will be some questions after our next speaker.

Our next speaker is Robert Novick, from the Chicago Regional Office of the Public Health Service, Regional Program Director for the Division of Environmental Engineering and Food Protection. This is an agency you have to remember because they are the people who are supplying a lot of the research money for the field of solid waste disposal. We have a project that they are paying for that I mentioned on incinerator residue. There was one request that they made to us and that was that we spell their name properly which we always do.

Bob.

MR. NOVICK: Thank you, Mr. Michaels.

I would like, first of all, to say that I am delighted to be here and participate in this very fine program, and in my office, I would like to say that George Eagle, Larry Crane, Robbie, and Ed Rosendahl deserve a lot of credit for preparing and presenting this excellent program.

There is one thing, though, in going over the roster, I note that practically all of those in attendance are engineers and I feel that we might have had a little more of a high tone to this meeting, a little more high class atmosphere if we could have had a few more scientist types.

I know you have heard the term engineer and the term scientist. Scientist and engineer -- these terms are bandied around quite a bit. You might get the impression that this is all the same breed of cats, but that is not true. There is quite a difference. A friend of mine explained the difference to me the other day. He drew a little analogy with the activities down at Cape Kennedy. He said that when they shoot off a missile and it goes up there and the capsule goes over into orbit, this is always hailed as a tremendous scientific achievement.

Then, on the other hand, when they shoot a missile and it blows up on the launching pad, this is an engineering disaster.

Do you see what I mean? If I had told that to a group of scientists, the response would have been much bigger.

You had better watch out, because somebody might make a crack that scientists design sanitary landfills and engineers design you-know-what.

In this whole process of incineration, what we are trying to do is achieve volume reduction. When you look totally at the volume of municipal refuse, you find that between 10 and 15 per cent is not suitable for charging into the furnace. Some of it is inert, some of it is large and bulky like rubble, street sweepings, and logs, and although this can be reduced by grinding and chipping, as Cass Rogus mentioned yesterday, the crushers used in Europe, generally in this country it holds true that between 10 and 15 per cent of all refuse is not amenable to charging into an incinerator.

Then, after you incinerate, you have a residue. This residue will vary in volume, but will range generally from 5 to 15 per cent, again, of the total volume of municipal refuse, so then as an end product, you have to dispose of it by burial, by landfilling, somewhere from 15 to 35 per cent of the total volume of municipal refuse.

I said you have to dispose of it by burial or landfill. The only other alternative would be to get some reduction in volume by salvage or by disposal at sea which is not presently being practiced to any significant extent.

Some of the previous speakers have mentioned residues and I will go along and say that from a well designed and well operated plant, incinerator residues will be inert, will be composed of ash, glass, metal, and a small amount of organic material. This material will be stable, will not serve as food for vectors, will not cause objectionable odors and it will be easily compacted. This is the case from a well designed and a well operated plant.

We have a number of such plants in the United States. We also have a number of the other kind.

During the last 20 years -- maybe 15 would be more accurate -- we have had a lot of thought and energy devoted to the problem of atmospheric emissions from incinerators, both particulate and gaseous. During this time, there has been a lot of progress made and we have made many advances to eliminate the objectionable features of incineration insofar as it relates to air pollutants. We should also now turn our thoughts and become more product oriented with regard to residues, and all of us should be aware the indiscriminate disposal of this material can cause problems.

As I have said before, you can get volume reduction by salvage, and this applies across the board to solid wastes whenever you can reduce the volume by salvage, you are helping yourself.

With the residue, the most commonly employed salvage is the recovery of metal. Now, unfortunately, the economic feasibility of this depends on the market value for this type of scrap, and it is unfortunately true that there are just a few locations in the United States where it is economically feasible to do this.

Ralph Black mentioned the recovery of cans and shredding for use in copper mills and mining operations. Yes, this is true, but one fair sized city could supply the entire need of the whole copper mining industry in the world.

Other uses for residue have been proven practicable such as ground filling for natural cement, for additives, road stabilization material, and as a cover material for sanitary landfills.

To produce a residue which is salvageable or useful for other purposes requires primarily that we reduce the organic material or oxidize practically all of the organic material present. If you interpret this into operation, it means that you employ high temperatures. The material is subjected to prolonged exposure in the combustion chamber, that you have a complex structure and close control of operation, and certainly does infer that costs are elevated.

In engineering incineration facilities, we have to take into account and relate the design to the final disposal method which is going to be employed for the residue. We are dealing here with the law of diminishing returns in that the rate of reduction of organic materials in an incinerator is not constant with time. The rate decreases. I think it would be fair to say that to remove the final 15 or 10 per cent of organic matter in residue would perhaps take as much exposure time in the incinerator as it would to remove the initial 85 or 90 per cent. Therefore, if we are going to employ a sanitary landfill -- and I emphasize the word sanitary -- for the disposal of residues, we wouldn't necessarily be concerned that we oxidize and remove all the putrescible material.

On the other hand, if we are going to use the material for cover material in a sanitary landfill, we would want to be pretty sure and pretty careful about removing at least the putrescible material.

One thing we can say with a fair amount of positiveness is that if we have an incinerator that is operating beyond its designed capacity, that the chances are that this incinerator will not be able to produce a residue which is suitable for reuse.

Well, then, what is the dividing line between the residue which is salvageable or suitable for reuse and one which is not? Well, this is a good question. This is apparently an area for fruitful research, as Mr. Michaels has mentioned.

They have found that in some of the reuses, there is a limit of about 10 per cent organic material in the residue, which seems to be in about the right vicinity. It may be for some uses, you would have to go lower than this. Ten per cent of organic material in the residue is equivalent to organic matter of 10 per cent or one and a half per cent of the total amount of material charged into the furnace.

You may have deduced that I feel that incinerator residues are not totally harmless and inoffensive and we should exercise extreme care and make considerate decisions in how we dispose of this material. Some of the characteristics which should be considered would include the bacterial content, or maybe I should say micro-organism, content.

In the usual situation, you will find that incinerator residues are free of pathogenic organisms, those organisms which are not destroyed directly in the process, which might be encased in a dense mass of organic material which is not completely burned, these organisms will be pasteurized -- if I can use that phrase -- or destroyed by the steam and heat generated in the incineration process.

The chemical characteristics. There are some nutrients in incinerator residues. Some authorities have referred to them as a very low grade fertilizer. Dr. Hackett had a list this morning of chemical characteristics of one residue, and I would certainly reinforce and restate what he said about the potential hazards of incinerator residues with regard to the possible contamination of ground and surface waters.

There have been a number of cases of this. I have already mentioned the organic content, a good residue for salvageable purposes should be down around 10 per cent in organic matter, but this perhaps needs further delineation. It would make a considerable difference whether this 10 per cent were bits and pieces of charred wood and paper or whether this 10 per cent were composed of putrescible material such as partially burned animal heads and entrails. Of course, the odor-causing potential of residue would come from the putrescible matter in it, and this is also the material which would serve as food for flies and possibly rodents.

Physical characteristics should also be considered. If you want to use this material for road stabilizing, we would want to know something about the concentration of fines and the potential for creating a nuisance dust condition. Material like fly ash which is light and easily displaced by wind wouldn't be too suitable for cover material. We would want to know something about the compactability and even moisture content. There has been more than one complaint about trucks leaking and dripping all the way through town because of the amount of water still remaining from the quenching process.

I am very pleased with Mr. Michaels who is working on a project to develop standards or criteria for incineration residues. I think this is a philosophy that should apply all the way through the field of solid wastes, and we have got to work toward development of criteria or standards so that we can measure what is good practice and, hopefully then, make more intelligent decisions therefrom.

I have a couple of slides. If we turn off a few more lights, we might be able to see this a little clearer.

... Slide ...

This is incinerator residue from a community in the state of Michigan. The metal has been salvaged from this residue, but you will note that it is being deposited in water. I don't know all the circumstances, but I am sure that Dr. Hackett would ask a lot of questions.

... Slide ...

Here is some residue that is also from the state of Michigan, a small community there. They are using residue successfully for cover material on sanitary landfill operations. Apparently this is a nuisance-free operation.

... Slide ...

Here is residue that obviously has concentrations of putrescible organic material in it. This would serve as a breeding area for flies, food for rodents, harborage for rodents, tin cans holding water, breeding area for mosquitoes and very obviously the only satisfactory solution of material such as this is disposal in a sanitary landfill.

... Slide ...

Here is the residue after it comes from the quenching process. This, of course, is considerably elevated in quality from the residue in the previous slide. I do see quite a bit of color in there. Perhaps there is quite a bit of room for improvement.

As Cass says, that is the end. Thank you.

MR. MICHAELS: Thank you, Mr. Novick.

Gentlemen, we are at your disposal. We are open for questions.

FROM THE FLOOR: You gentlemen mentioned quite a bit about quenching water this afternoon. You, Mr. Michaels, mentioned how important it was to see that it was handled properly.

Mr. Rogus, in your Betsy Avenue plant, the one that you had the picture of, does this one come from the river and go back to the river, this quenching water?

MR. ROGUS: The water that is used for cooling purposes in the water jackets for cooling of the shafts and the grates and for quenching purposes of the residue is city water which is rather expensive, but nevertheless we use it, and we waste it. It is one of the regrettable things. Under the present water shortages, we are studying the problem of how possibly we could use the adjoining sea water.

FROM THE FLOOR: There are a number of plants that have been built, incinerator plants, recently. I have heard of two which have been stranded because the original inter-governmental agreements fell through. One of them is in Euclid, Ohio, and there is another one in our community.

I wonder what should be done with the state law to develop the public utility concept and to insure that such inter-governmental agreements would not fall through, thus causing, in effect, a blight on the community.

MR. MICHAELS: I think there is a session scheduled later this week which will explore the problems of inter-governmental relationship.

I don't know the answer to your question. Do any of you gentlemen feel like answering that?

MR. NOVICK: I think you found a good solution for it.

MR. MICHAELS: Pass it on?

MR. NOVICK: Yes.

This concept of inter-governmental cooperation is included in legislation presently being considered in congress and I am sure Ralph and some of the others will have more to say about it later in this week.

MR. MICHAELS: Does anybody in the audience want to comment on that?

MR. FLOOD: You know, Cass Rogus made a remark that I think ought to be straightened out. He said I was responsible for the third stack on the Betsy Avenue incinerator. I think he didn't say enough or he said too much.

In the first place, I was not responsible for the third stack. This was at the insistence of the consulting engineer. No more gases are being handled with the three stacks than were being handled with two. The gases from the two stacks are being diverted to a waste heat user and are put through the third stack. The reason they did this, I don't know. My insistence was that if they had to have a third stack, it had to be set as high as the others, it wasn't going to be set lower. This is what I was responsible for.

There are a few things, Abe, that you said, that I would like to comment on. You mentioned some things about on-site incineration. Of course, this is extremely important in New York City because we don't have the capacity in our central incinerator to handle all the rubbish that is generated in the city of New York.

We have overcome some of the shortage by the use of on-site incinerators to a large degree, and by separating the chute for the refuse from the chute for the garbage, this can be done. This has been recommended by the Research Advisory Board of the National Academy of Science, and they have published a pamphlet on it. The city of New York also has criteria on such residential incinerators.

There is one thing you said, Abe, that I want to at least clarify or comment on and that is your reference to salvage, the salvage of the heat and the salvage of the residue, the salvage of the tin cans. I don't think that salvage is justifiable in itself in any central incinerator. The primary purpose of the incinerator is to reduce the refuse, but when you do this and use a refractory furnace, you are working against your best interests. A refractory furnace is a very expensive proposition. In order to preserve it, you have to either allow a leak into the furnace or deliberately introduce in the furnace large quantities of air so that your temperature will not go over 2000 degrees, or you will get slagging.

You mentioned the three or four kinds of brick you used, brick at the grate surface, brick at the lower surface, and in the secondary furnace, and then in the stack. All of this is extremely expensive.

In Europe they have water cooled furnaces, not waste heat boilers which are remote from the refractory furnace through which the hot gases pass, but we have water cooled furnaces where you get advantage of all of the heat in the refuse by radiant, invection, and conduction. This seems to me to be a rather important distinction between a water cooled furnace and a waste heat furnace.

As far as the cost of the plant, in order to provide steam and power perhaps in the incinerator plant itself, I couldn't agree with you more. This is only a secondary thing and doesn't amount to anything, but very many large cities in the country may have street steam, may have a power plant alongside the incinerator plant, and here is where you should use this heat from the refuse, which has half the heating value of bituminous coal. This is a matter of millions of dollars in a city like New York.

In Dusseldorf, Germany, where they had a prototype incinerator in connection with the municipal power plant, they put the incinerator furnace under one of the boilers in order to test this out, and based upon this, they decided to build the full scale plant the same way. The refractory is almost entirely absent from this plant. Their operating income from the value of the steam which goes into the power plant, the value of the scrap metal which they salvage, and the value of the residue they sell is equal to their operating cost.

You mentioned Atlanta, Georgia, which, by the way, is not a very good plant as far as air pollution control is concerned, but it is a good plant for the prime purpose of burning out the refuse. Here they separate the metals from the residue and they happen to have a steel mill in Atlanta so there is a ready market for this, and they have a market for the metal. This is incidental, but the residue is so well burned out that there is a line of trucks waiting for this to be discharged because the contractors use it as a road material.

The last thing that I want to talk about is the White Marsh incinerator. Perhaps you have some later information on that. The data on the White Marsh proposition is that they had considerable corrosion near the grate. This was almost entirely due to the fact that they use cold water. They didn't generate steam under pressure, but circulated water through that so that the fire side of the furnace of the water wall, was below the dew point temperature, the dew point of the hot gases.

I have taken considerably more time than I wanted to take, but I felt I should remark on these subjects.

MR. MICHAELS: Thank you, Bill.

I wonder, Cass, do you want to take a couple of minutes?

MR. ROGUS: Paradoxically as it may seem, Europe is revolutionizing refuse incineration. At lower operating costs than ours, they are achieving the three goals in incineration that have been repeatedly spelled out, namely, they operate an incinerator that is relatively clean, much cleaner than ours, free of dust, free of odor.

Secondly, they burn out the refuse to a residue which has less than three per cent of burnables by weight of the original refuse, and less than one half of one per cent of putrescibles.

Thirdly, the stack emissions are very substantially better than ours because they are below the point of 25 pounds per 100 pounds of gas corrected to the 100 per cent. We have not even remotely achieved any of those objectives in our best and latest incinerators.

How do they do this? First of all, insofar as dust control is concerned, they produce negative pressures, slight negative pressures within the tipping-charging operations. The air is pulled out from within these areas through ducts and used as combustion air, after some filtration. The residue burn-down is achieved primarily because of the type of grate systems that they use which, as compared with the American grates, do positively and emphatically, mildly but continuously, agitate and turn over the refuse bed so that you have continuous contact with air.

Incidentally, Abe, their air for combustion is not only limited to about 30 to 60 per cent -- that is the excess air, but most of it is used as under fire. They use approximately 75 per cent of this excess air as under fire air.

How do they control and why do they control this excess air? They control the excess air and dust emissions from within the furnace first, because they use an airtight steel plant envelope around the entire furnace instead of having the articulated brick construction that we have.

Secondly, because they achieve all of this mild desired agitation of the refuse bed by means of the grates that they use, and there are three types that I can commend to your attention. They dispense with the need of manual stoking and therefore they dispense with the use of the large doors which are so common in our practice which the manual stoker will open up and fail to close and control.

More importantly, as Mr. Flood has pointed out, the use of water cooled walls is an extremely important element, and this is irrespective of whether you do or do not generate steam or power, you use water cooled walls for two reasons: One reason is that in that fashion you can entertain much higher temperatures within the furnace, and therefore you do not have to introduce cooling air ; and secondly, by controlling this excess air, they reduce the volume of gases and particulates in the gases within the furnaces so that the volumes of gases that you have to handle by your air pollution control equipment are substantially lower and therefore your capital and operating costs of your air pollution apparatus is very substantially reduced.

By reducing the excess air, you reduce the amounts of nitrates that you otherwise would create when you use relatively large volumes of gases within your furnace.

The supplementary apparatus that they use almost invariably are electrostatic precipitators which they have been using over a number of years now, apparently very successfully, and either preceded by or followed by mechanical separators.

Finally, to control the emission of the aldehydes and perhaps some of the noxious gases, they do resort at this time to very high stacks.

As I have mentioned previously, the stacks are never less than 300 to 350 feet and are as high as 550 feet.

In summary, I would like to say that to those of you who are very much interested in the design of modern, advanced incinerators, by all means study what they are doing in Europe.

MR. MICHAELS: Does anybody want to comment on what Cass has said?

MR. KALKHOFF: One of the biggest failings we have had in the past fifteen years is that the architect designs the building and then we poor engineers try to fit something into it. In Europe, they design the incinerators first and wrap a building around it.

I have been in plants where they have had seven men working and there were twenty-one toilets.

We have five offices in one incinerator plant that I have been in, two of which are paneled. They have a certain amount to spend, so what do they do, they cut it out of air pollution, cut it out of great size, or just plain chisel someplace.

I am of the firm opinion that we engineers had better start designing a furnace and tell the architects to wrap a building around it.

As far as steel enclosed furnaces, we have had them in this country for ten years. I cite one at the United States Air Force Academy, another one in Florida, quite a number in other sections of the country. Brick seems to be more native to the eastern seaboard than it does to the midwest for one reason, corrosion. We don't have quite as much of that in the midwest, I don't think.

Also we design to somebody else's artificial limitations. We say, "This area says we can get by with a Ringelman No. 2 not to exceed the Ringelman No. 2 for three or four minutes," so what do we do, we design an incinerator for that particular code instead of designing the best unit we know how to do. It is about high time we started designing the best unit we know and forget about the artificial codes.

I don't know if anyone wants to argue with me on that, but we are at a point right now where we hide behind the nice little skirt, the nice little pose of "We are meeting the code." I have been to innumerable meetings, have been to inspect innumerable incinerators, and I find too much of this sort of thing.

Gentlemen, when you go on an inspection trip, all of you know it is geared up for the inspection. You know that because you are guilty of it, and you are guilty of it, and I am guilty of it, and all of us are guilty of it. One thing we ought to do is drop in unexpectedly, which I have done, and I have seen a plant that I had seen three weeks before when it was a model of efficiency, and it had degraded down to its normal efficiency.

We go out and spend two and a half to five million dollars for incinerators, and then we get some person about three degrees above an idiot to operate it, and we feel very proud of ourselves.

I was in a plant several weeks ago that I dropped in unexpectedly on. It was a design similar to the Euclid incinerator.

These Phi Beta Kappa's that were running this, the first time that I was there, they knew we were coming, and it was a model of efficiency. Then I drop in unexpectedly. They load this incinerator up to the bottom of the charging gate and then close the charging gate and sit down for the next three-quarters of an hour and enjoy themselves. You certainly have no trouble finding that one because you can do as the children of Israel did, follow the column of smoke by day and the pillar of fire by night.

We have got to cut out making the incinerator look like the local Carnegie Library and get something down to a purely functional stage, and I think we have got to take over from the architects.

That is all I have to say.

MR. MICHAELS: I would like to comment on that. I think you will find in many communities the prime design contract, if you want to call it that, is let with the consulting engineer. The contract with the engineer is retained in a secondary position. Personally, I don't think the engineer should limit his design to the equipment and then use an architect to wrap the building around it. I think the building is an integral part of the incinerator and should be designed by the engineer which is the way we do it, incidentally, in Philadelphia, and I think they do the same in New York.

The only contribution that the architect makes is to the facade of the building and to the architectural features, door jambs, things of that nature, and the bronze plaque.

This is the way it is practiced, which doesn't necessarily mean that our engineers are doing as good a job as they should be doing, anyway.

I believe that there are other things that we ought to talk about here. I am not trying to defend our practices here in the United States. I think that perhaps we are doing a little better job than has been indicated.

The European practice is based on European problems and European refuse, which refuse is, in fact, quite different from ours, although you can't tell this by pictures. The pictures that we saw perhaps looked something like our refuse. The figures that I have seen which indicate the BTU value of European refuse show that this material has a lot less paper, perhaps a lot more moisture, maybe more food waste -- I am not sure where the difference comes from, but the numbers that I have heard indicate BTU values somewhere between 3000 and 4500 BTU's, whereas here in the States, we are talking about something in the neighborhood of 25, 30, or 35 per cent higher, and the material has different characteristics.

Maybe water walls would be better, I don't know, but as to the question of operating at high temperatures, I am not a chemist. I have been told that the introduction of higher temperatures, regardless of the amount of air used for combustion, would produce increases in nitrites -- oxides of nitrogen which are, of course, supposed to be a more serious air pollutant than the particulates. If there are people here that know this is so or that this is wrong, I would like to hear it. We can't just say that we are not doing something.

Well, let's say that the Europeans are doing something better than we are.

One other thing, I have had personal contact with a company in Europe who wants to build a plant like the one in Philadelphia. I sent them a set of specifications for this plant that is currently being built for us. They sent the price to us for the mechanical portion of the plant which was just about 75 to 80 per cent higher than the price for installation that we have, not with refractory walls, but with water walls.

Perhaps the economics doesn't work out quite as simply as it would appear to. Certainly you can't compare salaries and wages in Europe with salaries and wages in the United States, and if you read a figure of X dollars in Europe and 2X dollars in the United States, you have to determine just what the value of these dollars happens to be.

FROM THE FLOOR: We are doing a preliminary study here in Columbus on the incineration of our refuse to reduce the problem. In discussing this matter with our consultant, we have touched on the subject of a rotary kiln type of an incinerator. I have not heard the words "rotary kiln" mentioned in this discussion.

Is this a dirty word, or do we know anything about it? Is there anything that we should know about it?

I understand the two incinerators at Atlanta, Georgia, are rotary kiln type. I also understand the one in Paris, France, is a rotary kiln. I wonder if there is anyone who can shed some light on the rotary kiln type incinerator as compared to the grate type.

MR. MICHAELS: There are some very good rotary kiln plants in the United States.

FROM THE FLOOR: There is also one in Louisville, Kentucky.

The one in Atlanta, Georgia, is the one that was producing the wonderful residue we are talking about, but there is one thing that I didn't mention with the salvage, the only air pollution control is the base of the stack. Once in a while they will shut down the furnace, and they take a couple of truckloads of fly ash out of there. They use the fly ash for fertilizing the lawns, and they have some lovely lawns.

FROM THE FLOOR: They also had one in Miami with a sign painted on it which read, "Ole Smokey," put there by a local cartoonist.

I did want to add one thing, though. There is a lot of misoperation and minor design fault, but nobody wants to touch on it because if you do, you are going to have to step on somebody's toes and tell them what they are operating is wrong.

FROM THE FLOOR: One comment Mr. Flood made was the excellent burnability that you get out of the rotary kiln. He did mention the air pollution.

Now, those are two separate problems. I would think that a rotary kiln type, if it does such a good job of burning could be supplemented with suitable dust collectors or air pollution control equipment to make a really efficient operation.

MR. ROGUS: First of all, to answer your question, the rotary kiln, so-called the volent type, is a very excellent incinerator. We have a number of such installations in this country, many more installations in Europe, including one at the San Juan plant in Paris, but they have been supplanted to a considerable degree in Europe by the other systems that I briefly described.

One of the disadvantages of the volent incinerator in addition to what Mr. Flood said, it has not been quite as good a competitive position because, in addition to the two rectangular furnaces that precede the rotary kiln, you have to have that in addition to the rotary kiln. This is a part of the package as far as the volent is concerned.

Now, to comment on a couple of points made by Mr. Michaels and by Mr. Kalkhoff, of course, naturally, in a discussion like this we always have some simplification. The enthusiasm that I have expressed here for the European, modern concept is not based on an idle quick visit to a plant. It is based on very extensive visits, considerable discussions with the engineers, examination of the various designs, and most importantly by analysis of their operating reports. That is item one.

Item two. Their refuse in Europe has progressively been changing so today it is pretty much akin to ours, with these minor modifications or qualifications, they have a lesser tin content and a lower calorific value, but, mind you, if you have a higher califoric value -- generally speaking, and again, this can't be an across-the-board answer -- but the lower the califoric value, the more difficult it is to control your situation in the furnace. If they are achieving what they are achieving with the lower BTU content of refuse, I think it is something to consider.

FROM THE FLOOR: We talked about a number of different kinds of incinerators, but something I haven't heard discussed is the disposal of sewage sludge along with the municipal waste. This is something which comes up occasionally in discussion. I would like to hear the speakers or any other persons who have views on this subject.

MR. MICHAELS: Does anybody have any experience in the disposal of sewage sludge in an incinerator?

FROM THE FLOOR: I know a little about this. Down in Louisville, they were disposing of dried sewage sludge by burning it, and they found that when they burn sewage sludge, they reduce their slagging problem. They still do this, I think, off and on.

They have more political problems than perhaps the plant that Mr. Kalkhoff referred to in Miami, Florida, where the mayor wouldn't let them use city water in the spray system, so, naturally, they had a lot of fly ash.

I think that it will be possible to dispose of either raw or digested sludge in a liquid condition in an incinerator plant if you design the plant to reduce the temperature of the flue gases by using water sprays. I think you could design the spray system so that you would inject the sludge into the gas stream along with the water you would normally inject and actually burn the sludge in suspension, especially if you were using a scrubber, a stainless steel scrubber, because the scrubber would then take the particulate matter out of the gas stream.

This has never been done yet and I think you would have relatively little problem with it. If you are going to have a difficult problem, this might be one way to handle it. This is what we really intend to do. We are going to have a difficult problem, but it is a solvable problem in that the design of the spray system is going to necessarily have to incorporate sprays that will not deteriorate rapidly such as carbide sprays or other material which will hold up in the system.

We intend to try it in Montgomery County and we think we will try it in Franklin County if we get that far along.

MR. FLOOD: I have had some little knowledge of burning sewage sludge. At least, I think I had better tell you what I have observed.

First of all, to supplement what you have said, when I was in Europe in 1963, I was visiting Dusseldorf and they took me to a plant in Carno nearby. This was a steel mill that manufactured incinerators, if you please, and also took care of the town waste. They did something else. They had a problem of handling the sludge which they dredged out of a river, if you please. The river got so choked up, they had to dredge it. They air dried it for a year and then they processed it by drying it out further, using heat from the incinerator to dry it out further, then they burned this in suspension over the grate of the incinerator and it was doing a fine job.

You know, of course, at White Marsh they are burning the sewage sludge. I don't know the latest on that, but perhaps someone else can tell us.

At a city sewage treatment plant in Staten Island, we bring the sludge there. We approved this some years ago and I haven't heard anything about it since so I guess it is all right.

Of course, we in New York City, encourage development of things that we think look good and they had an engineer that came in to us that was developing an incinerator. His idea was to combine the incinerator plant and burning sludge. What he would do is dry the sludge out as well as he could by putting it on a filter mat, and then he would use this mat of sludge as a filter to take the air·pollution out of the gas stream before the dried out filter cake went into the furnace. I don't think he ever had a successful operation, but he was still working on it.

MR. MICHAELS: This White Marsh installation consisted of depositing untreated but filtered sludge, undigested sludge, directly on top of the refuse bed before it was introduced into the furnace, and there visually appeared to be no evidence of sludge in the residue, but the color of the residue and the color of the sludge and the color of the make-up of residue was such so that one could not just look at it and say that it was burned. No tests had been made of the residue to determine whether or not it actually was incinerated, but this is the way they handle it, and from the appearance standpoint, it looked like they successfully incinerated it.

MR. KALKHOFF: Several years ago I was called into a chemical plant in my previous connection and they had a sludge that was pretty close to sewage sludge as far as water content, inert matter, and so forth, even to combustibility. By using a conveyor and a vein feeder, a metering feeder, dropping it on a splinter hearth which was arched and came to a shape something like that (indicating), and blowing air supply onto the splinter hearth, we were able to get rid of this sludge. Being a chemical plant, of course, there was no absence of chemists, and they analyzed the sludge and said that we were doing a good job of getting rid of it.

After three or four years, they found a use for the sludge so we stopped that, but it can be done. That is one way of doing it. I would say we tried it another way, by putting it on top of the garbage. We could get rid of it, but we couldn't stand the odor.

MR. MICHAELS: Which odor, odor of the effluent?

MR. KALKHOFF: No, the odor of the pit.

The one way that we were going to go, and then our money ran out, we were going to try this splinter hearth, and I believe it will work. If you burn this in suspension, most of it flashes off, hitting the hot hearth, dropping through an 1800 degree to 2000 degree temperature, most of it is gone before it hits the grate.

One thing on operation, there is a saying that we put on the wall that might be good for all of you in the design section. "You can design a fairly foolproof incinerator, but you can't design one to be operated by fools."

FROM THE FLOOR: In the increase of grass in the summertime, is that the reason why some of the incinerators don't burn properly?

MR. MICHAELS: It shouldn't be. When you design a plant, presumably you should recognize seasonal variations and provide for them so that the increase in grass would add to the total load, increase the amount of moisture that you have in your refuse.

However, since generally moisture is not a problem, it should not affect the operation. You could have a lot of dirt.

FROM THE FLOOR: Usually most cases of incinerators that we have, or that I know of, they won't dump their grass because they can't burn it in the summer months. The amount of refuse and the amount of grass clippings -- for instance, in the city of Wickliffe, and the city of Euclid, they have so many grass clippings that they can't handle them in the incinerator.

MR. MICHAELS: If it is collected separately and comes in as a big mass of matted material, then you are talking about something that approaches sewage sludge in characteristics, so you do have a special problem. If it is mixed with other rubbish, it shouldn't make any difference.

FROM THE FLOOR: I would like to make two comments on this subject. On Mondays, days following weekends, we haven't gone far enough in operation to run tests on it, but the pit is green. The grass is very striking. It makes it very difficult to get a proper fire in the furnace.

The other comment is on the matter of burning sludge. Waterbury, Connecticut, for a period of fifteen years has been using a combination of incineration for disposal of refuse and sewage sludge. They take the hot gases off the incinerator, dry the sludge, and then return the dried sludge by conveyor into the furnace. It works successfully and has been doing so for fifteen years.

FROM THE FLOOR: There was a comment earlier touching on the location of incinerators. I want you to comment on the significant determinations in the location of incinerators in relation to urban areas.

MR. MICHAELS: First and foremost, you have to find a place that will be acceptable to the public, or to most of the general public. You never will find a spot that will be acceptable to everybody.

Secondly, from the standpoint of air pollution characteristics, you don't want to locate down in the bottom of a valley. If you can locate it in an elevated location, this is certainly most desirable.

If you are going to use a lot of water, it may be desirable to locate near a source of water so that you can get water at reasonable prices.

From the overall standpoint of economics, locating as close as you can to the center of the collection area that is going to be served is extremely important. The physical characteristics of the city, the picture I showed you of a plant going into an old quarry, right on the side of the hill, this is an economic consideration.

These factors are all important and should be investigated, but next to the ability to produce a plant that will meet the public health requirements, air pollution, land pollution, water pollution, the acceptability to the public is most important.

FROM THE FLOOR: The question, harking back to quench water, do you have any data or information regarding the character of the waste quench water? Cass Rogus mentioned that they wasted it.

I am thinking, what is its strength in terms of dissolved material or suspended matter or pH, the BOD, and how do you get rid of it? Does it need pre-treatment in order to be discharged into the sanitary sewers, or what loading is made on sewage treatment where it is needed?

MR. NOVICK: I don't have any specific knowledge on it. I imagine it would be very strong, but the quantity would be very small.

Does anybody here have any firsthand knowledge about that?

MR. KALKHOFF: I have been running some tests at Skokie, Illinois, and we have been getting a pH of around 8 which is around the level of the natural water in that area. At the end of the week before we clean out, we find it runs from 3 to 5. We are doing it for a reason. We are going to try to treat it, not at Skokie, but under conditions which we will design.

MR. MICHAELS: Bob Shoenberg is the man who is running the residue research project. He is working with the Drexel Institute in Philadelphia.

MR. NOVICK: We have done a limited amount of work on cooling water, but our findings are that they run predominantly on the acid side, not real acid, but somewhere between 5 and 6.5.

As far as the solid contents go, yes, they are very high in solids. Most of the solids are settleable. We don't have too many suspended solids.

As far as discharging into a municipal sewer system, I would say no pre-treatment would be required.

MR. MICHAELS: I would like to comment on that. We do pre-treat all of our waste water, at least by simple settlement, and we retain it for 30 minutes or longer, in a simple settlement basin.

In our new plant, we are taking water from the river and discharging it back to the river and we are passing this through a Dorr clarifier. Actually, it is more the size of a grit chamber, and we are treating with lime and alum to try to maintain pH control and accelerate precipitation, but retention there is somewhere between 25 minutes and a half an hour.

FROM THE FLOOR: What do you do to your sludge?

MR. MICHAELS: This gets racked up and it is deposited directly into a residue truck.

MR. KALKHOFF: You understand I am talking about a closed circuit?

MR. MICHAELS: Yours is a recirculating system?

MR. KALKHOFF: Yes, because of the limited water supply. This is not a one-pass proposition. This is recirculated and only make-up water is added.

FROM THE FLOOR: I would suspect the pH would vary considerably whether this is water used for cooling the residue or the waste water from a scrubbing operation. The result is that you would get an acid residue. I don't know whether it could be equalized to some extent before discharge, but it would seem to me that the variations would be relatively extreme.

MR. KALKHOFF: Most waters are all together. You do not separate your spray or quench water, you use it as much as you can.

In other words, it goes into the conveyor directly, so the water is not separated from spray or any place else.

FROM THE FLOOR: I have seen some information second-handed on this. I don't have any personal knowledge of these figures, but they are very brief. They indicate BOD is in the order of 5000 and 10,000 parts per million, depending on where the water is used and what it is used for. The pH varies on where the water is used and what it is used for.

If you mix in a conveyor, the pH of the water discharged from the conveyor will depend on the relative magnitude of the acidity and alkalinity and the volumes of water in different cases. I personally feel this is an area where quite a good deal of comparative work could be done. I don't think the problem has been well defined, or even well started.

MR. MICHAELS: Jack, I would like to ask you a question. You said that the Cleveland regulation permits two-tenths of a pound. Do you have any plans there which approach this figure?

MR. WUNDERLE: I am not sure whether we do or not. This is the figure they use for incinerators. It is specifically for incinerator installation.

Prior to 1962, they had the ASME code of 0.85 per thousand pounds. About that period, there was some difficulty with steel mills in the area and, basic oxygen manufacturers of steel were concerned. This also had a bearing on the incineration limits being lowered because you want to look at the total picture in the air pollution situation. You can't play one against the other as favoring one over the other, and the city of Cleveland looked into incinerators as well as open hearth operations. The limits were lowered on all, and this is an ongoing thing on which they have time limitations as to when these different operations have to meet these statutory limitations.

MR. NOVICK: I would like to comment on the comment that was offered from this very productive side of the room over here on designing to meet codes. I think we should go back and look at this.

In this country, health codes, air pollution codes, water codes, and all other facets of the environment are developed from the concept of prevention of health effects which would be deleterious to people, or any other deleterious effects. Health codes are minimum codes. They are not based on what is practical or what is achievable, and so I would certainly wish to endorse what the gentleman said about the folly of designing just to meet codes.

We find when this is done, there is no margin of error and all too frequently we fall short.

Also on this question on incineration of sludge, I did have occasion to talk awhile back to our water pollution people about this, and apparently there seems to be an increasing trend that more incineration of sludge will be done. The big motivating factor here is that sludge handling and disposal in the normal sewage treatment plant amounts to 50 per cent of the construction cost and a good share of the operating cost.

Of course, incineration of sludge is feasible. We know it is done in many cases. I would think that it should be somewhat easier than the general incineration because the quality is certainly more consistent than refuse itself.

Also I think the basis of some of these self-sustaining sludge burning processes is the dewatering of sludge to ten per cent solids. If you can achieve ten per cent solids, you can incinerate sewage sludge in a self-sustaining process.

FROM THE FLOOR: I am curious about this code, too. The best guarantees we have gotten so far industrially from any manufacturer has been 0.2 per thousand pounds. I don't think there is an electrostatic collector in operation in this country on a municipal incinerator. I don't know how anybody is going to do what the city of Cleveland wants done right now.

MR. WUNDERLE: Many manufacturers will guarantee performance, but they will guarantee it with stipulations. I suppose the manufacturer of steel falls within one of these stipulations.

FROM THE FLOOR: I am not sure how many of the gentlemen know that the American Public Works Association has sponsored, with financial help of a number of cities and states and counties, the development of a device for measuring the particulate matter that comes from the effluent of incinerators. The first two stages of this study, which were conducted by the APWA in conjunction with others, have been completed. Right now it is a matter of collecting the necessary funding, or getting the commitments, at least, for the remaining $42,000 that will be necessary for this large stage of developing the monitoring device, and the prototype has actually been built. It has been shown to be effective and it is a device that will measure the particulate matter.

I was out at the IIT research laboratory about a week ago and looked at it. Of course, at that time, the report had not been written.

This last stage is actually field testing which would extend over a period of about 18 months, and it is planned to install the monitoring device on one of the Chicago incinerators, and to observe the operation of the device over a period of time and then to make any necessary changes that might be involved so that specifications can be arrived at and manufacturers interested can see the device in operation at this plant.

MR. MICHAELS: Those of you who are associated with the municipalities and are actually interested in incineration and the air pollution aspects of it would be well to consider talking to your government to help support this program.

While making announcements and appeals, Leo Flood gave me a note and asked me if I would make an announcement about ASME incinerator meeting which will be held in New York.

When is it?

MR. FLOOD: I don't know the exact date. It will be sometime in May, 1966.

MR. MICHAELS: Leo, I can't make the announcement. I don't think it is right.

MR. FLOOD: All right, I will see Robbie about it tomorrow.

FROM THE FLOOR: Visiting your northwest plant, I was watching the fellows stoking from the side doors. Have you ever run into a problem with discarded war surplus materials like hand grenades?

MR. MICHAELS: You mean 20 millimeter shells, or something like that?

FROM THE FLOOR: And aerosol cans.

MR. MICHAELS: Aerosol cans are popping all the time. If you were there, you heard them. We had one or two explosions that we thought might have been shells. One of my superintendents at one of the other plants has a 20 millimeter shell that was caught before it went in, so this is possible. We haven't experienced any damage that I know of as a result of this sort of a bit of refuse, but this could happen.

WEDNESDAY MORNING SESSION

COMPOSTING

The Wednesday morning session of the Seminar convened On September 22, 1965, at 8:30 A.M., Mr. Crane presiding.

MR. CRANE: Yesterday we had a lively and entertaining session on incineration. I think I can promise you that this morning will be even more so, because this is a very controversial subject and one which a lot of us do not know too much about, and one which may be coming to the fore in the method of disposal, and that is composting.

We have Dr. Karl L. Schulze, professor in the Department of Civil Engineering, Division of Engineering Research, Michigan State University. Dr. Schulze was born in Achen, Germany, took his undergraduate work at the University of Berlin. He earned his doctorate at Kaiser-Wilhelm Institute of Biology in 1939.

In 1951, he started serving four years as a research director for International Agricultural Products, Green Bay, Wisconsin.

Since 1955, he has been with Michigan State University.

He is an active member of several professional and technical societies.

Dr. Schulze.

... Dr. Schulze presented his prepared paper ...

COMPOSTING AS A WASTE DISPOSAL METHOD

By Dr. K. L. Schulze,
Assoc. Professor,
Division of Engineering Research,
Michigan State University,
East Lansing, Michigan

Waste disposal becomes a problem as soon as the population density increases beyond a critical limit. One of the characteristics of a city is that it represents a very densely populated area. This means that all cities have waste disposal problems. As far as liquid wastes are concerned, there are quite a number of highly developed treatment processes available, such as the active sludge process, the trickling filter, and the anaerobic digester. As for solid organic waste material, it seems that the development of suitable disposal methods has not reached a comparable status.

According to the Bureau of the Census, about 64% of our population live in cities and smaller communities classed as urban. This means that about 100 million people in the United States produce garbage with each person contributing a daily average of about one half pound of this material. Thus, there are about 25 thousand tons of garbage to be disposed of per day.

A recent survey by the International City Managers Association to find out what American cities do with their garbage shows that most of them use it as landfill. As of 1960, 484 cities practiced sanitary landfill, 371 cities had open dumps, 110 fed garbage to hogs, 109 used incinerators and 34 used salvage methods. In a few places garbage was ground centrally and added to the sewage for anaerobic digestion along with the sludge from the sewage treatment plant. Composting was mentioned only once. To my knowledge there is at this time, no large city in the United States, that is a community having above 100,000 population, which would practice refuse or garbage composting on a full scale basis. Most recently, however, the city of Houston, Texas, has embarked on a large scale experimental composting program. On the other hand, there is no doubt that the simple landfill procedure can not provide a solution to the solid waste problem for the future.

Open dumps are objectionable from a public health point of view. Flies, rodents and mosquitos breed on exposed waste material, odor and smoke problems are quite common. Even in sanitary landfill there are significant problems in controlling odors, flies and rodents. Furthermore, extensive growth of many cities and the development of suburban residential areas have reduced the sites available for landfill disposal. Hog feeding is another method that presents problems in regard to public health. The garbage has to be sterilized before it can be used as feed. Incineration has advantages insofar as the operation can be highly mechanized, requires a relatively small space and is hygienically effective. But this method is expensive, it can increase atmospheric pollution considerably and the ash and non-combustibles have to be disposed of separately. Almost everyone agrees that it would be best to convert the organic waste material to a useful product such as compost, if this could be done economically.

Why then, is composting not being practiced to a greater extent? Certainly there have been numerous attempts by private enterprise to build and operate composting plants which would use garbage or refuse as a raw material. But so far these attempts have failed.

Perhaps typical is the case of Oakland, California, the city with the "Golden Garbage." In 1952 several national magazines such as Colliers, Business Week, etc., carried extensive stories about the Compost Corporation of America and its plant at Oakland which converted garbage to a product called "ComCo." This material was sold as a fertilizer at a price of $4.65 per 100 lb. bag. The plant was designed to handle 100 tons of garbage per day. The process consisted of sorting out paper, rags, bottles and tin cans for salvage, and mixing the garbage with soil and manure and a special bacteria starter. After grinding, the material was piled into windrows where the actual decomposition took place. After three weeks the composting process was said to be finished and the material ready for marketing. A few years later the whole thing disappeared due to "internal difficulties," as it was explained in the newspapers.

A similar story can be told about the plants at Williamston, Michigan; McKeesport, Pennsylvania; and Phoenix, Arizona. The Phoenix plant was built by the Arizona Biochemical Company for a capacity of 300 tons per day and started operating in fall 1962. Just two years later in the October 10, 1964, issue of the Saturday Review an article appeared under the title - "The Coming Struggle to Breathe." Hidden under this title was the obituary of the Phoenix plant, tracing the development and the demise of the most recent attempt at large scale composting.

It is not my intention to analyze the reasons for the high rate of failure in these composting enterprises. I would like to mention only two aspects of the picture. The first is that in many cases the operation was dominated by the idea of gaining large profits, which is apparently difficult to do with composting. The second is that the field attracted promoters who made unsubstantiated claims as to the value of the product and who did not have the factual knowledge for a successful operation of the process.

That the process has inherent value is shown by the history of composting in Europe, especially in Holland. The first full scale plant, and at the time the largest in the world, was built at Wijster in the Netherlands in 1931. This plant is still in operation and handles the refuse of 700,000 people from the cities of Den Haag, Groningen, and Zandvoort. The method used there is called the "van Maanen-System" after the man who developed the plans for the plant. The system consists of dumping the raw refuse from special railroad cars onto long piles or windrows, 6 to 8 feet high and about 12 feet wide. The decomposition process takes place under the open sky and requires 6 to 9 months for completion. The temperature in the piles increases to about 160° F. and occasionally the piles are turned by a grab crane designed especially for this purpose. Separation of the inert material is done after composting by a series of vibrating screens and a magnet. The final step consists of grinding the compost in a hammermill. The annual output of compost at this plant is 105,000 tons and is sold mostly to farmers.

Over the years a special organization known as V.H.M., or translated "Refuse Disposal Cooperative," has been created. This organization is 51% government owned and it handles the refuse disposal problem on a national basis. It is planned that eventually all city refuse and garbage in Holland will be processed through composting plants.

Today about 35% of all municipal refuse in Holland is converted to compost by fifteen full scale plants of different types and most of these plants have been built after the year 1952. One of the newest plants is the one at Arnhem, which I visited in 1962, and which is shown in the following slides.

The plant serves a population of 126,000 people. The incoming raw refuse is processed through the following steps:

1) Large combustible and non-combustible items such as boxes, furniture, mattresses, tree limbs, tires, etc., are separated by hand. The combustibles are fed into a small incinerator,

the non-combustibles go to a landfill.

2) Next, ferrous metal such as tin cans, etc., are picked up by a magnetic belt and discharged into a hopper. This material is then compressed by a hydraulic press into bales of about 160 lbs. weight and sold for salvage.

3) This is followed by a Dorr-Oliver rasping machine and a hammermill. The rasping machine works like a slow shredder, whereas the hammermill has a fairly high rotating speed. Due to the high speed the mill is simultaneously used as a ballistic separator. The ground-up refuse leaves the mill in two fractions:

a) the heavier particles, such as glass, china, gravel, etc. This fraction is rejected and amounts to 4% of the total weight of refuse;

b) the lighter material which is mostly organic and which as a final step is

4) conveyed to a roller-crusher.

The discharge material from the roller-crusher is then ready for composting. On the overall, 28% by weight of the total refuse is rejected or incinerated and 72% is used for composting.

All the preparatory steps described take place inside the plant which is shown in the following slides. The building is solid and clean and well taken care of. There is a reception room where the operation of the plant is explained to visitors by the use of maps, diagrams, and a scale model.

Holland, however, is not the only European country where composting has gained a permanent place as an accepted method of solid waste disposal. The next three slides show the Baden-Brugg plant in Switzerland which I also visited. The building is certainly very attractive and fits well into the landscape. The installation is located on the main road from Zurich to Basel. The color slide shows the rear view of the building and the next slide is a photo of the Multibacto silo type composting device which goes back to the original Earp-Thomas digester.

The next slide shows a list of European plants, demonstrating the different types of processes used.[1]

As of 1962 there were four plants in Germany, four in

Switzerland, four in Japan, and one in England on the Isle of Jersey. The largest single plant in the world at the present time is located at Bangkok, Thailand, with a capacity of 300 tons per day.

In looking back over the material presented so far, you can see that windrowing is still the most widely used composting technique, be it in Europe, Asia, or in this country. It is also the simplest and the most ineffective technique. This will become clear from a consideration of the theoretical basis of the process.

The biochemistry involved in the decomposition of organic waste material is as old as nature itself. Otherwise, our planet would be covered by now with the corpses of dead animals and plants. However, composting in the sense discussed here means more than just the natural breakdown of organic debris. From its Latin origin "componere," the word "composting" means "to put together." Probably this relates to the fact that in a compost pile normally many different types and kinds of waste material are "put together" for the purpose of humus production. Obviously, the origin of the word does not provide a sufficient clarification of its meaning. We need a definition of composting, at least something close to a definition, and I would say that "composting is the biological decomposition of solid organic waste material under aerobic conditions."

The basic reaction of the aerobic decomposition process is simple enough. Whenever organic waste material of any kind, such as leaves, weeds, spent food, or garbage containing pieces of meat, vegetables, fat, paper, etc., is piled up, experience shows that it will begin to heat up in a matter of days or weeks and that the pile will retain its elevated temperature for weeks or even months until finally the temperature declines toward ambient. When this point has been reached and when no reheating is observed after turning the pile, then it is said that the reaction is finished and that the waste material has been converted to compost.

The results of this process are quite striking, as you have seen in the slides. The appearance, the structure, and the odor of the refuse or garbage are completely changed such that the initially offensive raw material has been converted into a marketable soil conditioner.

Judging by the almost infinite variety of substances present in the original mixture of waste materials, it is obvious that the detailed chemistry of such an aerobic decomposition process must be very complicated, and that many types of microorganisms can be expected to take part in the process. This is true. Nevertheless, it is possible to use simplified equations which show the essential reaction. A typical reaction would be the oxidation of carbohydrates, that is sugars, starches, glycogen, cell wall material, and cellulose:

$$C_6H_{12}O_6 + 6\ O_2 \xrightarrow[\text{(+ bacteria)}]{} 6\ CO_2 + 6\ H_2O + 673\text{ kcal}$$

$$180\text{ g} + 192\text{ g} \longrightarrow 264\text{ g} + 108\text{ g (using molar weights)}$$

Converting to pounds:

$$1\text{ lb} + 1.067\text{ lb} \longrightarrow 1.405\text{ lb} + 0.6\text{ lb} + 1700\text{ kcal}$$

glucose + oxygen (+bacteria) -------> carbon dioxide + water + heat

1.067 lb O_2 = 340 liter = 12 cu ft of oxygen or 60 cu ft of air at standard conditions ($0^oC.$, 760 mm Hg.)

Normally, if you just dissolve a lump of sugar in sterile water and let it stand, no oxidation would take place. But in the presence of bacteria the oxidation proceeds immediately because all aerobic bacteria possess among others, an elaborate enzyme system which is specifically geared to catalyze the oxidation of carbohydrates.

The equation expresses qualitatively and quantitatively several of the most important features of any aerobic decomposition process:

1) The process is biological in nature, that is, it depends on the enzymatic activity of living microorganisms.

2) 60 cubic feet of air are needed for each pound of carbohydrate that is oxidized.

3) 1700 kilocalories of heat are liberated per pound of carbohydrate oxidized.

4) Nearly 1.5 pounds of carbon dioxide and 0.6 pounds of water are produced in this reaction.

5) There is a considerable loss in organic matter involved in the process since so much of the carbohydrates is converted to carbon dioxide which escapes into the atmosphere.

Unless specifically and intentionally sterilized, all organic waste material such as garbage, refuse, sewage sludge, agricultural waste from food processing plants, etc., contains countless billions of different kinds of bacteria, even those that belong to the special group of heat loving or thermophilic bacteria.

In case you have not looked at any bacteria lately, I would like to show two electron microphotographs of bacteria from East Lansing sewage, taken at 6000 times magnification. The pictures show the typical short rod form of these microorganisms and their structure which is much like that of a sausage; the jelly-like living interior substance is completely encased by a semipermeable membrane. All food material has to pass through this membrane before it can get into the interior of the cell. This is the reason why bacteria cannot use any particulate matter directly as food. The nutrient material has to be first brought into a dissolved condition.

The second slide demonstrates the multiplication process which proceeds simply by elongation of the cell, followed by partition into two new cells. Under favorable conditions this reproduction is very rapid, in fact it has been measured that under optimum conditions bacteria can double their weight within one-half hour.

Visualizing the conditions existing within a compost pile we find that all prerequisites for such a rapid multiplication of bacteria are fulfilled: 1) An abundance of organic food material, 2) air filling the voids between waste particles, and 3) moisture. It is therefore not surprising that during the first days of the decomposition process the microorganisms multiply rapidly with the concomitant production of a large amount of heat. Since refuse and garbage possess a relatively high insulating capacity the temperature inside the pile will increase within 4 to 5 days from ambient to 140, 160, and sometimes 180° F. At these temperature levels only thermophilic bacteria can exist. Due to their high rate of metabolic activity they will maintain the temperature between 130 and 170° F. for 10 to 14 days. After that apparently the specific types of substrata used by these thermophilic bacteria become exhausted and the temperature gradually decreases toward ambient. This is the typical sequence of events which has been investigated in many laboratories, such as at the university of California and in my laboratory at Michigan State University[2, 3, 4].

The following slide shows a typical temperature-time curve obtained at the Berkeley, California, windrow experiments, where about 160° F. was reached after four days. From this point on the temperature remained at the thermophilic level for about ten days, and after that the declining phase began.

Going back to our basic oxidation equation, we recall that 60 cubic feet of air were needed in the oxidation of one pound of carbohydrate. In view of this fact it is obvious that the small supply of air provided by the voids in the pile will soon be depleted of oxygen. It can be shown that the supply of air by diffusion or by the so-called chimney effect, induced through the temperature gradient, is totally insufficient to satisfy the existing oxygen demand.

This means that somehow air has to be brought into the pile and the simplest way to achieve this appeared to be by turning. This, however, is a primitive way of supplying air since the decision on when and how often to turn depends mostly on the experience and personal attitude of the operator. Therefore, we decided at Michigan State University to investigate the quantitative aspects of the process. Especially we wanted to know how much oxygen was consumed per gram initial volatile matter per hour, and how this oxygen consumption rate changed with temperature, and with moisture.[3] The apparatus used for these investigations is shown in the next slide.

It consisted of a rotating cylinder made from Lucite and having a capacity of 15 to 20 pounds raw garbage. Air was supplied and metered through a gas meter. The temperature was recorded graphically on a continuous basis. The exhaust gas was dried and connected to a paramagnetic oxygen analyzer. The analyzer indicated the per cent oxygen remaining in the exhaust gas. Since normal atmospheric air contains close to 21 per cent oxygen, the percentage of oxygen left in the gas after passage through the decomposing material was a direct measure of the amount of oxygen used in the process. This enabled us to compute oxygen uptake rates for the complete run of the experiment. In addition, the oxygen analyzer provided us with a quantitative guide for the correct amount of air supply, since underaeration would actually result in a reduction of the exhaust gas oxygen concentration to near zero. The efforts put into the laboratory work paid off. As the next slides show, we were able to establish quantitative data for the most important process parameters.

The temperature curve for this experiment demonstrates an initial phase of two days duration, a thermophilic phase up to the 9th day, followed by the temperature decline. Simultaneously with the temperature recordings, the oxygen consumption rate was determined in mg O_2 per gram volatile matter per hour and the curve shows first of all that this rate was directly proportional to the temperature, in fact the two curves were almost parallel, and secondly, that a peak demand of about 4.5 mg O_2 per gram volatile matter per hour was reached. Plotting more than a dozen of such rate measurements versus temperature, as shown in the next slide, proved that actually the oxygen consumption rate just about doubled with every 10°C increase in temperature:

100°F = 37.8°C = 1.0 (rate in mg O_2/ g VM/ hour)
115°F = 47.0 C = 2.0
136°F = 58.0 C = 4.0

Calculated in another way the data showed that during the thermophilic phase air had to be supplied at a rate of about 14 cubic feet per minute per ton of volatile matter in order to satisfy the demand. As mentioned before, during the discussion of the oxidation equation, there is a considerable loss of volatile matter connected with the composting process. In fact, our experiments showed an average loss of 37.6% in dry weight and 40% loss in volatile matter as shown by the table in the next slide.

The next two slides demonstrate the results we obtained in regard to the effect of moisture content on the activity of the compost. Using an air dry compost, the sample was split up into seven parts and each part was adjusted to a different moisture content from 11.2% to 70.1% moisture. Then the oxygen uptake rates of these samples were measured in the Warburg apparatus. As you can see, the two driest samples at 11.2 and 19.6% moisture had practically no activity. Then the activity increased with increasing moisture up to a maximum at about 60%. At higher moisture contents the activity decreased again. The next slide represents a summary of these data in curve form.

As a result of this research I developed in 1957 the idea that under certain conditions, that is with a controlled continuous supply of feed material and air and at controlled moisture ranges, it might be possible to maintain a composting process continuously in the thermophilic phase. This would mean a considerably higher efficiency of the process because the delays caused by the initial and the declining phase in the batch method would be eliminated. In addition, such a constant maintenance of temperatures between 130 and 170° F. would mean a high degree of sanitary safety because pathogenic microorganisms would have very little chance to stay alive through this kind of prolonged steam bath. The process was first tried during the years 1959 and 1960[4] in a small pilot plant which is shown in the next slide.

A rotating 55-gallon drum with a capacity of about 250 pounds of compost was fitted with a tightly closing decklid, an air supply and a temperature recorder. Portions of shredded garbage mixture were fed every day or second day into the drum. The rate of air flow was adjusted according to the results of the analysis of the exhaust gas by a Beckman oxygen analyzer. If the oxygen concentration in the exhaust gas decreased below a predetermined level, the flow of air was increased,and vice versa, if the exhaust oxygen concentration increased above a preset level the rate of air supply was decreased. The results of these experiments were quite striking, as shown in the next slide.

The graph demonstrates that we were indeed the first ones to maintain the temperature of all of the decomposing material in the drum continuously between 130 and 160° F., and thus to demonstrate the feasibility of a continuous thermophilic composting process. The small pilot plant did not incorporate any automatic control features. But, beginning in 1956, right along with the investigations on the effect of temperature and moisture on the composting process we did substantial experimental work on the automatic control of air and temperature. The idea was to use an oxygen analyzer, a thermostat, and a solenoid valve for the automatic control of the temperature in and the air supply to a decomposing mass[5].

The solenoid valve was installed in the air supply line. If the thermostat was set for a temperature of 140° F. (60° C.) then the solenoid valve closed off the air supply whenever the decomposing material in the unit reached this temperature. After the temperature had cooled off by about 2 degrees Fahrenheit, the solenoid was opened by the thermostat and the air began to flow again. This caused the material to heat up and the cycle repeated itself. The experiments showed that we were able to automatically maintain and control the temperature in the decomposing mass to within 2° F.

Aside from eliminating the delays caused by the initial warm-up phase which is inherent in all other composting methods, a continuous thermophilic process is of eminent practical importance in view of the public health aspects of composting. Besides garbage there is another solid waste that causes disposal problems and this is sewage sludge.

Normally, sewage sludge is digested anaerobically and then dewatered and air dried on sand beds. In recent years many sewage plants use vacuum filters to dewater the sludge. The sludge cake still contains 70% to 80% water but it can be transported and disposed of by landfill. In several instances dewatered sewage sludge and garbage have been combined for composting. This is dangerous, however, since sewage sludge contains a high concentration of all kinds of pathogenic bacteria, microorganisms, and worm eggs. With the old composting methods, especially in windrows, there was no guarantee that all of the decomposing material would be subjected to the pathogen-killing high temperatures above 130° F. The outside layer of the windrow piles never reaches the same high temperatures that are measured in the inside. It depends, then, on the frequency and thoroughness of turning, whether all of the outside material has a chance to get inside the pile and to reach high temperature. With the continuous thermophilic process there is no question about this problem. All of the decomposing material is continuously maintained in the thermophilic phase and these temperatures can be recorded on a 24-hour basis. Up to date sewage sludge is generally first digested anaerobically in large heated tanks before it is dewatered. The reason for this procedure is given by the fact that raw sludge cannot be dewatered on sand beds. In recent years, however, chemical filter aids have been developed which make it possible to dewater raw sludge from primary settling tanks or mixed sludge containing raw sludge and waste activated sludge on vacuum filters. For the first time it now appears possible to eliminate the expensive anaerobic digesters and to design future waste treatment facilities where garbage and dewatered undigested sludge are combined and are disposed of by composting.

As I mentioned before, the first successful continuous thermophilic composting experiments were conducted with a 55 gallon drum in 1960 in my sanitary engineering laboratory at Michigan State University. In recent years, in fact since the beginning of 1964, these principles of continuous thermophilic composting and of automatic temperature and air control have been applied by the Fairfield Engineering Company to their mechanical composting pilot plant located at Altoona, Pennsylvania[6]. The application proved to be a full success. Since the installation of the automatic temperature and air control system the temperature in the composter has been maintained continuously in the thermophilic range between 130° and 160° F. In fact, the temperature can be selected and preset anywhere within that range and can be maintained automatically with a tolerance of about 2 degrees F. It is obvious that these automatic control principles and the continuous thermophilic process are adaptable to many different types of mechanical composting devices. In fact, it appears that they will be applied increasingly in the future, as modern composting develops from an art into a science.

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MR. CRANE: Do we have any questions for Dr. Schulze? We have about ten minutes.

FROM THE FLOOR: I have two questions. Composting changes the form of the material. What does it do to the volume?

No. 2, is any liquid produced, and if so, what characteristics does the liquid have?

DR. SCHULZE: We will say we go in with about 60 per cent moisture. We try to go in with something about like this. The material is not sopping wet at 60 per cent moisture. It is fairly dry. It doesn't drip. You do produce a lot of water, as you say, but half a pound for each six pounds of carbohydrate is about the rate. This goes out as vapor because the temperature is high and the relative humidity is not 100 per cent when it comes in, so it takes up moisture.

Warm air is capable of taking up moisture, has a higher saturation point. This is taken up and carried out as a vapor. You have a continuous loss of water from the material.

Now, it depends on how much air you put through the material, you can actually dry it out when you blow too much air. When you do not blow enough air, you can collect some of that moisture.

Experience has shown so far, to my knowledge, that under normal operating conditions, you wind up with pretty much the same moisture that you go in with, so there is no drainage from the normal operation. You do get drainage from windrow piles sometimes, but there you don't have that kind of control. Normally in these mechanical operations, you do this.

As far as moisture is concerned, I don't see anything of a problem at any particular point. As far as volume is concerned, there is a large reduction. I would say that it is on the order of 50 per cent. You have about half the volume of what you put in.

FROM THE FLOOR: This is a question about equipment. Are we going into this further? If so, there is no need to ask the question here.

DR. SCHULZE: As far as automatic control, yes. There is another little sketch coming up at the panel later.

FROM THE FLOOR: I was interested in the silo method.

DR. SCHULZE: Silo method, I have nothing on that.

FROM THE FLOOR: Isn't the silo method the windrow method?

DR. SCHULZE: No, the silo type, I meant the cylindrical structure where you have several decks, you pile it on the upper deck and you have a plow and a hole in there, and it drops through to the next deck.

FROM THE FLOOR: They furnish the moisture at the top and bring in the air from the bottom, is that the way it goes?

DR. SCHULZE: The prepared material, the moisture is added before it gets in there. The material is in good condition, say between 50 and 60 per cent moisture. The air is supplied from the bottom and it has branches into each deck, so they have valves there and they can aerate each deck differently or all together.

FROM THE FLOOR: With respect to your Warburg tests, doctor, I was curious there, did you have any means of controlling the moisture inside the flask, or were the moisture contents that you indicated merely those of the starting part?

DR. SCHULZE: That is what we put in.

FROM THE FLOOR: The second part of the question, then, were these short-term runs to merely establish a rate of oxidation, or were they long-range runs?

DR. SCHULZE: It showed the time there. We ran them for several hours to stabilize what the rate did, and we showed the running time.

FROM THE FLOOR: I wonder if I understood you right. In Holland, did they have combined collection of all the refuse in the community? Do I understand right that 72 per cent of all the refuse collected in this community is compostable, only 28 per cent is not?

DR. SCHULZE: That is right. That is the figures that they give for that plant in Holland, and it is supposed to be combined collection so they have got 28 noncombustibles and 72 per cent combustible.

FROM THE FLOOR: The nursery men of our county would like to know if there has been a reliable evaluation of the product for agricultural purposes.

DR. SCHULZE: I have some material with me. It is not part of the presentation. I surely did use up an hour there saying not very much. They made the experiment in Holland that the raw compost was very difficult to sell. What was selling good -- I mean, they have to switch over, they have to develop the product. The better they made the compost, the better it sold.

Now, the part going into farming, that is spread on the land, and that part is decreasing more and more, and the part that is going into nurseries, the part that is going into high grade garden produce is increasing all the time, but you do have to produce the good compost for that. In other words, it has to be finely ground, screened out for inert materials. I don't think they are adding specific fertilizers, but we have to have well composted fine material that you can use for gardening, actually, and this is where it is going.

I have some material on this. Maybe we can talk about it later.

MR. FLOOD: Dr. Schulze, is there any odor connected with this matter of composting, either in the windrow method or in your method?

DR. SCHULZE: The odor will appear immediately when you don't supply enough air. As soon as the processes switch over, you have odor production. As long as you are able to control the process and supply the air that is needed, there are no obnoxious odors necessary. There are some odors, fermentation odors at some times, but no foul odors.

The foul odors come about when you don't supply enough oxygen. My contention is that with the windrow method, you just can't avoid the depletion of oxygen inside.

MR. FLOOD: As far as the method you described in Holland, you told about having to segregate the material. Is this all done by hand except the magnetic separation?

DR. SCHULZE: Well, the noncombustible items are separated by hand. This mattresses, springs, furniture, tires, rubber boots. That is done by hand.

FROM THE FLOOR: But you mentioned rags and bottles, too. Is that separated by hand?

DR. SCHULZE: Yes.

FROM THE FLOOR: Do they sell them?

DR. SCHULZE: Yes.

FROM THE FLOOR: The tin cans, they are separated magnetically and baled, are they?

DR. SCHULZE: Yes.

FROM THE FLOOR: Have these a market value, or is this just a method of compressing them to get rid of them?

DR. SCHULZE: These are sold for salvage, the baled cans.

FROM THE FLOOR: During the war, I had something to do with salvaging tin cans, but these all went to de-tinning plants, had to remove the tin before they could be used in the steel mills. Since these are baled directly from the garbage, how is this problem solved?

DR. SCHULZE: Frankly, I don't know. I did not at the time inquire or talk to these people in Holland. I can't even talk Netherland language. They did speak English to me.

I did not inquire about the way they handled the baled ferrous metals. They must do something with it because they did tell me they are sold for salvage. What the specifics are, I don't know.

You see, this branches out into so many other areas, it is pretty hard to know all of it.

FROM THE FLOOR: I am not sure I am clear on all of this. Does paper go into the composting operation? If so, what happens to it?

DR. SCHULZE: Yes, there is always a lot of paper in all of it.

FROM THE FLOOR: Does it have to be shredded?

DR. SCHULZE: Yes. I don't know of a composting process which wouldn't grind and shred and screen. They all do that. You have to create surfaces so the material is made into particles somehow, and there is an area in itself again, grinding, shredding, milling.

The degree to which paper or cellulose is converted to compost or humus, that is another thing. That is how far you break it down.

FROM THE FLOOR: It is necessary to remove all the plastic materials?

DR. SCHULZE: Well, I don't think that it is necessary. It does not really interfere with the composting process, however, plastics are not broken down to any considerable degree, so it is very unsightly when you are through with the process to have all these shreds of plastic all over the plant, and I found that in order to produce a good compost, it does pay to try to get the plastics out.

Again, I am not well versed in how best to do this and so on. All I know is that you will have these plastic shreds left over. They will be in the pile.

FROM THE FLOOR: In your laboratory method that you use, the drums and so on, you said you were adding garbage each day or every other day that kept the temperature, and also you had to take out some. You are taking out today what was added yesterday. Is this composted?

DR. SCHULZE: We first take it out and then put in. The stuff we did always take out has been in there either one day or two days. That was the minimum. On the other hand, you have complete mixing in the dry, everything is mixed together. What actually is coming out is a material which contains a minimum retention time particle of one or two days, whatever you use as a feeding cycle, and there is a fraction there, and it goes by a Goss curve.

It will have a probability distribution of particles that are much longer in there and still longer in a lower amount, and when you get the mean retention time where the largest part of the particles -- how long it has been in the drum, this would be a problem of statistics. It depends on how long the thing has been running, but it certainly does not mean that what you take out is just stuff that has been in there for one day. There is a certain fraction of particles that have been put in yesterday, but they are a small part when you look at the distribution curve.

FROM THE FLOOR: However, if the sample were composted further, you would still have the line which would complete the composting cycle. It is not the finished product, by any means, at 160 degrees in your lab experiment.

DR. SCHULZE: Right. Not only that, but I think generally this is true. When you run such a thermophyllic composting process, what you get out of this thing has been going through the thermophyllic phase, but it is not finished. You would have to have a curing after that.

MR. CRANE: We are going to have to cut off the discussion here. We will have further discussion after the panel have discussed this matter.

COMPOSTING PANEL

Dr. K. L. Schulze; Messrs. Victor Brown, John Houser, and David Wantland

MR. CRANE: We will now proceed to the composting panel session.

We have one panel member who has had some difficulty in arriving. We will hold him for last and hope that he does show up. We are going to handle this so that each of the panel members will get twenty minutes to make his presentation and if he desires to use part of his time for questions directed to him personally, this is his prerogative; otherwise, the discussion will be following all of the presentations.

To lead off, we have Mr. Victor Brown, president of the Metropolitan Waste Conversion Corporation out of Wheaton, Illinois.

Mr. Brown is a metallurgical engineer, received his training at the University of Indiana, and Armour Tech.

He was connected from 1934 to 1942 with Republic Steel Corporation; from 1942 to 1963 was executive vice president of the Kropp Forge Company.

In 1963, he became president of the Metropolitan Waste Conversion Corporation.

Mr. Brown.

MR. BROWN: Thank you very much. I appreciate being here.

As you can see, I am really a displaced garbage man now. It is a standing joke when I see my colleagues of many years from the steel and exotic metals business producing aircraft engines, and what-have-you, they say, "What are you doing now, Vic"? "Well," I say, "I am in the garbage business."

They turn their noses up because, after all, I have fallen from grace now and I have to make my living among the rubbish piles of the nation, but I found out these rubbish piles are getting pretty big and the subject is as interesting and perhaps even more challenging in many aspects than the problems of building bigger and better aircraft engines and rockets and what-have-you.

At any rate, I am not here this morning to talk about the theory of composting, or whether garbage will or won't compost. You heard all about that a little while ago very ably, and we know it will. I am not here to review the history of composting plants. You heard a little bit about that and it wasn't too bright, but I will assure you that there is a great deal of interest for the future of the composting plant and I am afraid that I am stuck in this future to a very extensive degree, and I hope that it will be good.

As far as the review I am going to make here, I came in with the idea that I was going to talk about the criteria for design and operation of a successful compost plant. Incidentally, I had better change that to successful commercial compost plant in the light of the fact that we have seen many different approaches to composting, but the one that is going to mean anything is the one that is going to be commercially stable in this country and one that will, as you saw in Europe, remain for many, many years and do a good job and a good service for the community.

The basic service aspect of the compost plant is one which will lend itself to the community's service requirements. This means it has to fit in and has to do a job. In doing a job it is, first of all, necessary that it be of such nature and such esthetic appearance that it will be acceptable in the modern American city. As you know, being very closely associated with the public opinion, this is becoming a much bigger problem than it used to be.

I remember back when I was first introduced into the steel industry, the people who lived around the steel mills thought nothing about breathing that smoke and the dust and fumes and so forth. This was a way of life. If anybody tried to take them out of that, they felt that there was something wrong with them, they couldn't take it, but today anybody who lives around a steel mill is one of the most critical citizens in the city. They want that smoke cleaned up. They want the air pollution business that they are hearing about and seeing in the newspaper, they want this to apply to themselves also. People are getting to be different from what they used to be.

In the matter of selecting a site for a plant, this must be considered. The matter of the economics of the haul must be in the picture. This is where a location for the plant has to play a major role and be able to fit into the environment of the city and also meet the economics of getting rid of the garbage from the home or the store and getting it to a place where it can be disposed of.

That brings us to the problem of the kind of a plant we are talking about. Dr. Schulze mentioned that he felt that windrowing was not satisfactory. I certainly agree with him because we also have a mechanical digester, as has Mr. Houser who will agree, I am sure, that windrowing is not for the American city. However, it does provide and has provided the introduction of composting to the city.

I have some slides here which will show a pilot plant which we bought in 1963 as a means of getting into this business.

... Slide ...

This particular plant was an effort on the part of the local Florida people to explore the potential of composting as a service to the city and also as a product to be sold for gain.

When we got interested in this whole field, we decided we needed a vehicle to move to this plant, and it was also decided that we would, because we had certain technical ideas, we had ideas of material handling, we had some good ideas, but we found a lot of them were not good, but we had to have room in which to move and this provided the vehicle.

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Here we have a small office, a part of the deal we bought. We painted it up and planted some flowers and made it look like something so that it would be more acceptable. We planted flowers and grass and used the compost left from the old operation. We planted the roses, the grass, and everything looks fine as you can see here.

To get into the meat of the thing, this plant was completely revised, and although we put in facilities which would keep the bill within about $300,000, which we had in our pocketbook at the time when we went into this particular part of it, we had to use some of the facilities that were there and we adapted them and bought other equipment and put the thing together so as to make the concept which we were interested in exploring, because before we thought that we were justified in going out and discussing our situation with the people, or talking contract with a municipality, we certainly had to have something in the background. This is the beginning.

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We have a receiving hopper which was a part of the purchase.

This took in about two to three truckloads of mixed garbage as you see here.

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The stuff looks like the stuff you see in your cities. It is full of paper, lots of whiskey bottles, and almost everything else. The material is brought up on an elevated area where we can run it across separation tables, and this is the usual scheme of running it through a belt as fast a rate as you can and taking out those things which you have been talking about this morning. In this case, we studied all sorts of things.

In fact, this provided about a two-year study of what constitutes garbage collection in this area of Florida. We found out later, as we studied other cities, it didn't vary a great deal from the rest of the cities. They all used a certain proportion of Maxwell House coffee, Heinz ketchup, and certain kinds of newspapers were read, funny papers, and so on. Generally speaking, the type of material you see coming across in Florida or Columbus, Ohio, or Houston, Texas, seems to be about the same stuff. Proportionately it may vary a little, especially in the summer, the place gets full of grass. Around Christmas time, it gets full of paper. Here is a variation which we must cope with.

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Here is the elevated section that you also saw in the other slide. We have a paper baler which automatically accumulates the paper and when we have the accumulation, we bale it immediately from the table and we explored the market.

How to handle garbage, how to sort it, what percentage, but we were also interested in what are the market problems of the salvage. What are the market problems of certain items which we may not want in the compost, but which may not be particularly potential as far as finding a sales market for it, and also, of course, the compost became a factor. We will talk about this later.

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Here we got the paper. We had facilities here for separating out other stuff and keeping track of it, weighing them out, weighing the stuff that came in, weighing the stuff that went out, and all the different aspects that we know particularly and specifically what each item constitutes percentage-wise, and I can tell you right now it varies from January through December.

... Slide ...

This is the inside of the plant. On the left you still see the parts of the picking table. Down on the end is the primary grinder. Across the back end you see a conveyor which goes up to a secondary grinder, and at the far right the beginning of the digester.

Here is a primary grinder from the back view. It is a small hammermill type grinder. It basically shreds the material. It is quite coarse, sections of the paper being perhaps six or seven or eight inches in size and, of course, wood is splintered pretty well. Any glass that got in there, which was only broken glass -- we took the whole glass out, but broken glass was splintered more, and it went from there to a secondary grinder.

... Slide ...

At the point of the secondary grinder, we put in sludge. This plant here not only explored all the problems of garbage, but it has gone into the sludge problem, and right from the beginning we did this and we have continued this study until today we believe we have many, many answers to the sludge problem as far as composting is concerned.

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The second tank is an ammonium nitrate collector. We also do a lot of fortifying and we feed additional amounts of nitrogen to the bugs so they had a little more food, but we also did some fortifying for the sake of the compost.

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Here is a view of the back and top of the secondary grinder, showing the metal separator, magnetic separator that kicks out all the cans and all the ferrous metal. The red bucket is where the sludge was introduced. We had to have a gap in there so that we could be certain that the sludge was moving because we found handling problems with the sludge and the silting problem was intense.

... Slide ...

Here is the beginning of the digester. This, incidentally, although we have all the equipment covered, we did not have sides on it because we found that we were moving out quite frequently, we needed more room and all we had to do was put a roof over it.

Florida is very mild and we had no problem there.

Here is the general concept of the digester. On the left is the material being fed to the digester. It does down and is tripped onto a small cross conveyor and put into a long trough type tank. It is put in there and the tripper moves back and forth like a shovel so we get intimate mixing of the garbage and the trash that is ground up so that if one truck comes in all grass and the next one comes in all paper, we do not get a segregated lump, but we get a very intimate mixing.

On the background, you also see the agitator which agitates from top to bottom and we do this as frequently as the schedule is set up, and this is set mechanically and automatically. It also doubles, because of its mechanical features, for unloading the tank. We take it all right out of the tank as you see it there and put it back on this belt again and send it down to the finishing department.

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This is the back end of the tripper and you see it going in from the other side.

... Slide ...

Here is the close-up of the agitator. You see, there is nothing more than a wide bucket-type elevator. It lifts it up and puts it on the other side of itself for agitating and for unloading, we insert into the back of it a little cross conveyor so that it drops down on the cross conveyor and puts it back on the belt here. This is very simple, very efficient. It works.

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Here is the back end of our digester. Incidentally, the first part of that digester, we made out of steel. Being a metallurgist, I thought we should start out that way. We found this pretty expensive and the back end of it, the last 140 feet of it, we made this out of concrete. It works better.

Anyway, it is a very efficient and very effective type of digester. The bottom is completely false in that we have about an eight-inch opening on the bottom into which we introduce air, and as Dr. Schulze so ably talked about this morning in terms of oxygen supply, we can give evidence to every bit of it. We know that on a six-foot pile of compost that has about an 18 or 19 per cent oxygen at one moment, and 15 minutes later when it gets into the thermophyllic range, 15 minutes later the oxygen is somewhere less than three per cent, so it goes down -- boom -- and if you don't replace that oxygen, you are merely delaying the compost activity tremendously

There are many other things which I certainly can vouch for, but I only have twenty minutes and I have to move on here.

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Here is the final grinder. As the compost is completed, we run it through the finishing section, through a final grinder where we further refine it, and I will say that composting, if it is to be successful as a commercial venture, must pay a lot of attention to the quality of the compost, and if you don't, you are just inviting slow stagnation of the enterprise. It has got to be of a quality which can compete in appearance with chemical fertilizers today on the market. I don't care whether it is Scott's Turf Builder or Vigero, and so forth, they make a nice, beautiful to look at, uniform in appearance type of stuff. Unless it is like that, we are not going to be able to compete with them, and this is our job. We have done a lot of work in this area and we have scheduled much more.

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We screen this. It goes across a vibrating screen, then it is sent over to a bagging operation and we do employ, in Florida, an active marketing professional. We know what our problems have been up to date. We have seen what they will be in the future. We believe we can anticipate what must be done, but the only way you do it is by doing it, so we have jumped into it. We bag it, sell it in bags, sell it with control chemistry so that we can compete with some of the chemical fertilizers, not that we may do this permanently, but we must know what we will have to do for the future when we get into some large commercial aspects. This plant can produce four to five hundred tons of compost per month. When we get over to Houston, Texas, we are one of the fellows who are going to prove that a plant in Houston is going to be a commercial success. We are spending almost two million dollars there. It had better be a success.

Let me say that in Houston, instead of having four or five hundred tons a month, we will have more like six or eight thousand tons a month, and so we had better have some of the answers to the questions that we see posed.

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We have a bulk storage bin here. This was one of the things we inherited when we moved in there. The stuff is not bagged and is put in here because we have a good bulk market developed in Florida. We either send it out in trucks or some of the local people come right over with the commercial spreaders and, as you see here, we load it into the spreaders and distribute it right to the orange groves or the golf courses, and many golf clubs have used it down there. Go down there and play on compost. It is good.

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Here you see some of the control features which we have had to put in. I can assure you we have done much more than this. We have carefully analyzed oxygen usage and requirements. We push the air through as I have indicated, but more than that, we have to watch moisture. We know, for instance, because we call ourselves a control batch system, we put in -- one day's supply goes into one batch and immediately after it is in there, we send our chemist in there and we list what we have in NPK. About the third or the fourth day, we decide what else we should put in there to bring it to the 3-2-2 analysis which we will be selling, and so we add the necessary chemicals and when it comes out, we have this control, so we do control the chemistry. We are able to control the chemistry, the moisture, the temperatures, and everything else. This is important to get this in the background so that you know what to plan.

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Here is a little shot of the building you saw over there. We do have a sufficient laboratory facility so we can do on-the-spot checks and we do. We have retained Dr. Retz' laboratory down there for extensive work and this has been of monumental benefit.

I would like to summarize. I could tell you more, but let's get into the economics. I am sure you are somewhat interested in this. In order for a plant to become economically feasible in any city, it is going to have to analyze what the city's problems are. It can attack the method of paying for itself in several aspects, but I will say this: Unless the city is willing to pay for the service on a substantial basis, I do not believe at this stage that a composting plant is going to be able to go into that city.

Another thing. There is the matter of auxiliary income which should be explored. This would be either from the aspects of the salvage or from the compost or both, preferably both. The whole thing has got to be laid out carefully, systematically, and completely.

Unless you are willing to do this, you won't get anyplace.

As far as coming up with a successful commercial plant, I believe that today the successful commercial compost plant is going to spell out something like this. It has got to be the beginning of something which certainly can be improved in the future. I do not believe that the plant that we will build at Houston is going to look like the one we built in Florida. It is going to be far improved, and it is going to be efficient.

The third plant had better have other improvements. I am sure we will see the introduction of composting on a really successful basis on the premise that the present price that will be going into plants, there are going to be plenty of opportunity to show what can be done. The tools of today are not the accepted tools of tomorrow, but let's settle on the basis that the tools of today are going to be acceptable for today, and I venture to say that you will see in the Houston concept of composting a very successful tool which will demonstrate for the country what real disposal success will be.

I will say this, further, it is going to be a combination of many types of people. It is not going to be -- I think I am all right as a metallurgist in this crowd, but I know that there are going to be many mechanical engineers, sanitary engineers, civil engineers, chemists, physicists, and pathologists engaged in this field. They will all have to contribute heavily.

I will add more. There is going to be a combustion engineer.

Thank you, Larry.

MR. CRANE: Your next panel member is having a homecoming. He received his degree in civil engineering at the Ohio State University in 1940, Mr. John Houser. He is the chief engineer for Fairfield Engineering Company, Marion, Ohio. He has had considerable experience as a structural engineer, also in the design and construction of conveyor systems and process piping.

During World War II, he had spent considerable effort in the defense area, including a chlorine plant in Alabama, bacteriological research, also three Adriatic plants.

In 1956, he joined Fairfield Engineering as the Chief Engineer, a position he still holds. For the last two years, he has been widely concerned with the compost plant in Altoona, Pennsylvania, which you have received literature concerning.

MR. HOUSER: Thank you, Mr. Crane.

It certainly is a pleasure being here today, and I feel that it is going to be quite a job to get through this in twenty minutes, but my primary interest is to acquaint you with the Fairfield-Hardy Digester. The Fairfield-Hardy Digester is a patented device for converting garbage and refuse, sanitary sludge, and animal and other waste into a usable compost or soil conditioner. All patent rights in the United States and a number of foreign countries are held by the inventor, Woodrow Hardy, and have been purchased by the Fairfield Engineering Company at Marion, Ohio, a firm specializing in the design, fabrication, and complete construction of conveyor systems.

The complete story of this goes back to the fact that Fairfield is primarily a concern interested in conveyors. No matter how you handle this material, it is handled primarily on conveyors. It is quite a problem.

The principal features of the Fairfield-Hardy Digester are, the digester can be fed continuously or intermittently. The digester operates completely in a thermophyllic stage, always above 120 degrees of temperature, generally from 140 to 180.

The digester is designed to furnish an adequate supply of air for complete aerobic digestion. The digester can stir or mix its contents continuously or intermittently. The digester is completely enclosed for close control.

We enclose the digester in Altoona, Pennsylvania, because of the very extreme temperatures. We operate there in temperatures down to 20 degrees below zero, so this is quite a serious load on a piece of equipment that has no external heat.

The equipment is equipped with automatic controls to regulate and record the temperature and oxygen requirements. The end product has a proper pH, no objectionable odors, does not attract or breed flies, does not harbor rats or vermin, is free of harmful bacteria. This 25-ton digester was installed in Altoona, Pennsylvania, as a pilot model in 1963 at the plant of Altoona FAN.

Since July, 1963, the digester has been handling the complete output of rubbish of Altoona, Pennsylvania. Altoona has a population of about 70,000 people. They have combined selection now so, consequently, they do not get all the commercial rubbish and garbage.

The Fairfield-Hardy Digester is part of the complete system which can be shown on this slide.

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It consists of the receiving hopper, and the apron feeder. These can be in almost any kind of configuration that is desirable, concrete bins, steel bins, or what-have-you. It also consists of a picking area.

The picking area primarily is to salvage items that are salvageable in the pick area that you are located. Some areas, some things are valuable, some things are not. One thing is not. One thing is generally picked out is large corrugated cardboard. That seems to be desirable in most all communities.

From the picking table, we go though a dry grinder. This is an ordinary hammermill which sizes the material before we put it into wet pulping system. We allow the tin cans to go through this dry grinder in order to shred them.

As to the cans, we find that women generally stuff garbage and everything else into tin cans, so naturally, if you try to pick the tin cans out, you will pick out the garbage with it. We shred it and run it through a magnetic separator which separates the tin from the flow and we wash the cans.

The main difference between our system and the normal system is that we now go into a wet pulping system. This is similar to the wet pulper that you find in paper mills. They are huge circular vats about ten feet to sixteen feet in diameter. Some work continuously, but these work batch-wise. We grind the material at a moisture of about eighty per cent, and then we have to go through a dewatering screw which brings it down seventy-five per cent, and then we go through a screw press which dewaters it still further to a moisture content of about fifty-five per cent. We can vary that moisture content from fifty-five per cent to sixty per cent or down to fifty per cent. All these work sufficiently well in the digester.

Above sixty per cent, the mix is a little bit hard to work because you just don't get the temperatures.

Another thing that the digester does, it will operate on a dry grind system. You do not necessarily need the wet pulping system. We do have a dry grinder installation over at Altoona where we by-pass the wet pulping system completely. It goes through the digester and then we put it through a drying process where we pelletize it first through a pelletizing drum into a horizontal dryer, and then we screen it and it is a pelletized material that can be spread by an ordinary fertilizer spreader or a seeder.

You saw some of the material out in front.

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The pilot digester can be shown by this diagram. This diagram doesn't have the roof on it for the reason of clarification, but you can see the material enters the digester from the top, from above at the center point. We usually feed by belt conveyors and then we drop into a horizontal screw conveyor which feeds across the top of the bridge.

Now, the digester consists of a circular tank 38 feet in diameter by 10 feet, 10 inches high, reinforced concrete block walls. On top of the circular wall, a steel beam serves as a track for which the bridge rotates. The center of the bridge is mounted on a hollow steel pedestal which is divided into one foot increments which also serve as dischargers.

In other words, the material is picked up in the middle and dropped down over the wier and is discharged.

From the bridge, this is supported by vertical screws. These vertical screws are rotated at various speeds. We start from the outside with a rotation of about 26 revolutions per minute and on the inside, we will run about 9 revolutions per minute. Those screws are driven by a variable speed motor and we can vary those speeds from the outside, from 26 down to about 9, and even on down toward the center.

The depth of the material for 25 tons a day is six feet. Now, we can increase the capacity of this digester 33 per cent by increasing the depth to eight feet, but the screws rotate around the digester at an interval of one hour to three hours, and that continually mixes the material by bringing the material from the bottom to the top and gradually working it toward the center.

This 25-ton capacity for this particular digester has a retention time of five and a half days. If you feed five days, only five days, you essentially have a retention time of approximately seven days, but theoretically, it is designed on five and a half foot depth for five and a half day retention time.

The bridge is mounted on chain driven rollers and is rotated by a five horsepower motor. When the material is fed into the digester by this twenty-four-inch belt conveyor from the French mill -- that is over here. We discharge the French press onto a belt conveyor.

The material is fed in along the outside wall and it is fed in at an ambient temperature of approximately 30 to 70 degrees and it immediately raises to the thermophyllic range of 140 degrees, assuring a thermal kill within five days of all harmful pathogens. Sample tests from our Lancaster laboratory, Lancaster, Pennsylvania, assures us that all pathogens have been destroyed. We even put raw sludge in the digester and found that the salmonella was killed.

As the bridge and rotating screws move counter-clockwise around the digester, the screws lift the material from the bottom to the top, and at the same time flow the material to the center of the digester. A speed and revolutions per minute and incremental rate of flow from the digester to the center pedestal is uniform, and it overflows to a flight conveyor to the digester tank and is elevated to a truck bed.

The material is dried and packaged and marketed as a fine ground pelletized soil conditioner to be applied by a lawn spreader or fertilizer spreader, or any similar tool.

Generally, the ground garbage has a pH of 4.3 to 5.6. If properly digested, a pH of 7.6 to 7.9 may be obtained from the digester.

The ground garbage and waste pulp is dewatered to 55 per cent, plus or minus 5 per cent, before it enters the digester. It is discharged at around 45 to 50 per cent.

The flow of air essential to digestion of the garbage and solid waste is supplied by four circular pipes below the digester. Those pipes have not been shown, but those pipes have air holes, small holes in the bottom, and it has been designed so that each ring has its own percentage of air, and this air varies quite markedly between the outside ring and the inside ring because the material, as it enters, requires much more oxygen than the material as it is completed.

If you use an automatic control system capable of maintaining the temperature at any level, plus or minus three degrees, through the thermophyllic range by continuously sampling the individual air of the composting mass and measuring the partial pressure with an electric potential reading in millivolts. The temperature is recorded every sixty seconds and on continuous cycle is very important.

We have been told that the thermophyllic bacteria die at 140 to 160 degrees. We continually sample and can get up to 187 degrees any time we want to set our controls that high. We don't feel that the 187 degrees is quite as desirable, however, we do get much better production when our temperatures are rather high.

The air bed below the digester is divided into two sections, two circular rings each. The temperature of each is controlled by a thermocouple connected to a temperature controller which has adjustable low and high temperature limits. Daily samples of the incoming material and digested discharge are sent to laboratories in Altoona, Pennsylvania, to determine moisture, pH, and volatile matter. The reduction in the volatile matter varies from 35 to 54 per cent.

This is quite remarkable. Normally, you would suspect about 38 to 40 per cent, but we do occasionally get as high as 54 per cent reduction. We have found that the nitrogen ranges from 1.5 to 1.9 per cent, potassium from 1.4 to 8 per cent, and phosphorus from 1.0 to 1.2.

I do have a few slides that show the plant operation in Altoona, and I think I will show a few of those right now.

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This is a typical sample of our daily checks. The top graph shows temperature, the second one shows oxygen, the center one shows pH, the third one is the moisture, and then the weight per cubic foot.

You see from the top graph we have four points of sampling in the digester. This is between screw No. 1 and screw No. 2, and this is between screw No. 3 and screw No. 4, and this between No. 5 and screw No. 6 and so on. Each of those parallel lines indicates this. That shows the temperature range, the lowest temperature was on the incoming material on a Friday after continual feeding, and it is down around 146. The top temperature will range up above 165, so we are now able to maintain that temperature range straight across the chart. I think one of the other pictures will show the strip chart where the temperatures are practically a continual line.

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This shows oxygen in millivolts up between 30 and 40 millivolts. The moisture is going in about 50 to 55 per cent and out around 47 to 48 per cent.

The pH in this is around 4.3, 4.6, always out above 7, varies up to almost 8.

The weight per cubic foot is around 30 to 33, and the top is around 41 to 42.

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This chart shows an average reduction of 47 per cent of volatile matter.

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Here is a picture of dumping the raw garbage from the dump truck into the conveyor leading into the dry grinder. You can see that you get all kinds of material.

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Here is another view of the garbage showing tin cans, bottles, and everything else.

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This is the dry grinder or hammermill.

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This is the top of the digester where the material comes in, and this is the center screw that leads out to the outside.

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Another picture of the digester. This is the rotating top or roof. This whole roof rotates with the digester.

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Here is a picture of the wet pulper. You are looking down into the wet pulper and you can see this black hole is a discharge port, and the little serrations in the middle is the rotor. The rotor is nothing more than a flat steel plate with a bunch of carbaloy bits that have been welded on. This does the grinding. If anybody has heard that, it is quite a terrific sound.

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Here is an end view of the digester showing the drive.

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This the screw looking down inside the digester showing the four rows of air pipes.

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Here is another view before we put the roof on, before filling, showing the steam coming off the material.

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This is the air blower showing the air plenum and a high pressure blower.

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This is our control panel. The strip chart, you can see how continuous and how straight the temperature record is there. It shows there above 160 degrees. The two square dials on this side are temperature controls. We can set the temperature to any point, plus or minus three degrees, and it will hold those temperatures. You can see how they are grouped there now. The temperature is on point.

The two other sides are oxygen controllers. These read every 15 minutes or so the control points are between the two arrows that you see there, and this shows it is not reading on either one of the four or the two arrows there now. These others down here are just automatic manual control buttons.

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This is the view looking at the end of the discharge, showing the discharge conveyor, dumping into a truck.

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There is a pile of compost as it has come out of the digester. You still see the steam.

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This is a Hill feeder getting ready to feed the material into the pelletizer.

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The back drum is the pelletizer. The forward drum is the dryer.

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This is a bin of the finished product. The finished product is a very, very fine product. We have a market for all we can make. Our biggest trouble now is that we don't have enough of it.

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This is an artist's sketch of the plant that we have proposed, standard 100 tons per day.

The significance of the Fairfield-Hardy Digester can best be evaluated against the following list of chronic problems of garbage and refuse disposal:

Constant volume of strong odors, attractive to rodents, attractive to flies, seepage, possible water pollutant. This has to do with landfills. Ash and dirt pollution, air pollution, unsightly open air handling, insanitary working conditions.

Against these problems, the Fairfield-Hardy Digester offers these solutions:

Garbage and refuse enclosed except for sorting and picking, odor problems minimized, after the material enters the grinder, odors are negligible. Not attractive to rodents, processed material not attractive to flies, processed material free of pathogens, no insanitary seepage or water pollution, no unsightly open air handling, sanitary working conditions, no ash or dirt precipitation or need of air control.

In summary, the Fairfield-Hardy Digester is a convenient, sanitary and economical method of reducing city garbage and waste to a usable soil conditioner that is beneficial to plant life.

Thank you.

MR. CRANE: Thank you, John.

Our next speaker got his plane trouble straightened out and he is with us. Mr. David Wantland, vice president of the International Disposal Corporation, Shawnee, Oklahoma.

Mr. Wantland is a graduate of the University of Oklahoma, served as a jet fighter pilot in the United States Air Force. After concluding his military experience, he joined the National Insurance Company as salesman and also studied business law in the evening at the Oklahoma City University. He progressed to hold sales and management positions in the aviation and aerospace industry.

He also served as management and marketing consultant to industries and municipalities regarding industrial development, specialized in plant location and in industrial financing.

He joined SACS, Incorporated, in January of 1964, as marketing manager. He is now the vice president for plant location and operation, International Disposal Corporation.

MR. WANTLAND: It is a distinct pleasure to be with you today. I hate to start my short talk with an apology, but because of a combination of airplane trouble and weather which forced us down at Indianapolis last night, I have just now arrived.

My name is really unimportant, but I think the topic we are here to discuss is very important. In this light, my company's name is International Disposal Corporation, and it has a rather varied background and history that might be of interest to you and help you to better appreciate what our interest is and what we feel we have to offer.

Coming from Oklahoma, it reminds me of the comment that Will Rodgers, famous Oklahoman said, that everyone talks about the weather and no one ever seems to do anything about it. I think the paraphrase can be made of the refuse disposal problem, everybody talks about it, but now, evidenced by this program and this seminar, you people are doing a great deal about it. We are very proud to be a small part in this coming solution to refuse disposal.

This history I referred to of International Disposal refers to several companies and, quite frankly, through several million dollars. It started some years ago on the campus of the University of Oklahoma where two gentlemen set out to develop a nuisance-free disposal method of a reliable nature to, in effect, dispose of the city's refuse. This is contrary to the European composting philosophy that we have seen evolve in that their main objective in many cases was to produce compost.

This involved many, many man hours, many, many dollars, and finally into machinery which could accept routinely and effectively the filthy and quite heterogeneous material developed in the United States. It did result in patented machinery, and Lockhead Aircraft

Company later took over the position of having rights to this process and built a plant in Los Angeles.

This was in the early 1960's. Their purpose then was to prove and develop economic data as well as to engage in some realistic activity for statistical purposes.

Westinghouse Electric Corporation was the electrical contractor on this plant. Later, Lockhead decided to divest themselves of these diverse operations and a company called SACS, salvage and conversion systems, was formed, in effect, to market these products to cities or interested parties.

By this time, Westinghouse became sufficiently interested that they wanted to be the manufacturer for this plant, and they established a contractual relationship with SACS that they would build any plant sold and would warrant or guarantee them to the purchaser or operator.

Quite, frankly, we weren't too successful. Cities, people such as yourselves, recognized the potential in composting municipal refuse. You also recognized the risk, the gamble, and the fact that in many cases, if salvable items were to be marketed and the end product or by-product, compost, was to be marketed, it would require competition with private enterprise.

All-State Insurance Company was contacted regarding financing of these plants and recognized this same difficulty. The final result was, then, the formation of International Disposal Corporation early this year with Westinghouse owning one-third, All-State Insurance Company owning one-third and former SACS shareholders owning a third. This allowed us, then, to, in effect, analyze the refuse problems of the cities in the United States, and where feasible, practicable, and if you will, profitable, to propose the location of one of our plants which we would own, Westinghouse would build and guarantee for us, and we would then, in turn, operate on a service type of a contract with the city; in other words, a price per ton.

This also removed us from the garbage to becoming bellboys which I am happy to say we are all overcoming rather rapidly from some of the other attempts where a slip of the pencil could turn you around to where the city wanted to be paid for the refuse because of the potential of turning the refuse into a usable compost.

At this point in our program, we normally show a ten-minute color sound motion picture film. In fact, this is a tour of our plant, but because of delay, this will not be held at this time. I understand it will be shown at 4:30 o'clock this afternoon.

This gives me an opportunity, too, for the benefit of those who have been referring to notes, you will notice that on Page M-10 a presentation of this paper was to be given by Howard Furlow of International Disposal. Frankly, if you have a chance to scan through the notes, I think you will get more out of his paper that was to be presented than my few comments here. I am speaking in his stead.

He became rather unfortunately ill yesterday and this contributed to the confusion as well as the airplane schedule and so forth.

In lieu of this ten-minute film, it then does give me a few moments to throw the floor open to questions at this time, knowing there will be a question-and-answer period later, but I think from what I have observed so far, those who preceded me on this panel explained the mechanical processes, the fact that there is a receiving area, various separations, whether manual, picking of paper and rags and other items that have a salvage market, if not they go through the process, a mechanical or magnetizing separation of tin cans and ferrous materials, and a preparation section with grinding, moisture added, whether it be sewage sludge or water, and then a digestive system of some sort.

We have, of course, the naturizer, patented process, closed building, with a series of stories, having a conveyor and after the material is ground, prepared, somewhat homogeneous mass is dropped onto the floor which slowly introduces it down to the floor below which directs it in the opposite direction, and the material is dropped, fluffed, aerated, dropped to another floor, and in three days is re-ground to a finer size to allow further decomposition. All this, of course, is of an aerobic nature, giving off only carbon dioxide and no noxious fumes or odors, and then with the total of six days, another grinding and then finishing section for preparation for marketing, whether it be a bulk, with perhaps a coarse grind, or maybe the finer grind which is sold in the bag to what we call the luxury market.

One application of the utilization of compost that we developed in this California location was the addition of grass seeds, liquid fertilizer, into a water slurry, in which the material is then sprayed onto a hillside, a cut, or a fill area, such as the highway project where the material forms a mat and a perfect germination base for the seed, and as it decomposes, becomes a soil conditioner, soil additive.

Naturally, this is but one of the many, and this is where the real true potential comes from these overall projects.

Once again, as I say, we feel we have a bit of a new concept that we are able to offer, a completely nuisance free, reliable -- you can be sure if it is Westinghouse -- economical, disposal of refuse. Truly, a city does not abdicate its responsibility or the risk, but they do minimize it by contracting with a financially responsible entity backed by All-State Insurance Company and Westinghouse Electric Corporation such that in effect we take over the responsibility and fulfill this obligation, usually with a rather substantial performance bond to insure that you can be sure with Westinghouse.

Once again, this film will be a short one, a tour of the original plant. I say original, because we have built more of the smaller plants. They are in the university. The Los Angeles plant was of a Lockhead design.

With all due respect to Lockhead, they are used to building things that fly, and Westinghouse was quite critical of the end result because it was built around existing buildings, and had lots of headaches. The plant that Westinghouse is building for us in Florida will be a fullblown Westinghouse design, more modular concept with their material handling experience. The film which you will see this afternoon at 4:30 will show the basic process and I hope it will be informative to you.

With that, I will throw the floor open if you have questions of us right now before the program is turned back to the chairman.

FROM THE FLOOR: When you say this is a 25-ton plant, is that raw material or finished product?

MR. WANTLAND: We normally speak of terms of incoming tonnage.

FROM THE FLOOR: You say you have done some research in economics. What is the average charge to the municipalities, counties, or private contractors, et cetera, for dumping at your plant?

MR. WANTLAND: We have one contract so the average is not difficult to arrive at. I hasten to add -- perhaps I should make a preface before I comment.

If you can appreciate, there are many, many factors involved in this such as land cost, labor rates, utility rates, particularly taxes which vary widely throughout the country and are very difficult to predict. If you can identify with the city and thus avoid paying taxes, you have a better contract and you have an acceleration program because we have a 20-year contract. Our experience has been in special situations, in other words, where we can predict a real valid growing market for the compost, the price might be around $3 or $4, somewhere in that range, such as the case in our Florida plant. However, we find other locales where you have extremely high labor costs or extremely high taxes and you cannot predict a fulfilling compost market. It might have to be well into the five or six dollar range.

Analyzing this, there are many cities with disposal costs, disposal only of many, many dollars a ton, we still find we are competitive in many cases.

I further add if you have a satisfactory landfill within a reasonable hauling distance -- this may sound strange for a composter -- that you can thank your lucky stars for a fine system and stay with it. You are still a prospect because it will be filled up some day and you will still be back.

FROM THE FLOOR: What is the cost per ton for construction of the plant?

MR. WANTLAND: I am not sure I can answer that exactly. We get a turnkey price from Westinghouse. They handle the complete construction. Admittedly, it will vary, but it will probably run in the $8000 to $10,000 per ton range, something like 800,000 dollars for a 100-ton capacity. That is a really rough rule of thumb.

FROM THE FLOOR: This is not so much a question as a comment. It is a form of a question. Without disclosing any trade secrets, we investigated composting for one of our clients. We agree wholeheartedly with you that it is a good process. Our problem is this: What are we going to do with the end product? I cite Jamaica, Phoenix, and innumerable other places that failed, that no longer have the end product, and the chief concern was that we could not conscientiously at this time, in all due fairness to being retained by the city to give them a solution, we could not conscientiously recommend composting unless there were some market research.

I am not being critical, gentlemen, but it looks to me like we have got the process down. We had better start doing something about the market. You are in a highly competitive market.

We called in a market analyst firm to find out the potential as they saw it today, not tomorrow or ten years from now, and they feel that it is a highly competitive market and unless you can sell this locally -- and that means within a marketing area of a radius of so many miles, it is economically unfeasible to make the compost.

In other words, we went back to you people. Feeling that the city would someday either have a pull-out which I am not reflectin on Westinghouse and All-State, again, but feeling that the general tre would be a pull-out and they would be stuck in the same position as Phoenix, yet they have put all their eggs in one basket. Again, they are very fortunate, as you just mentioned, in having a good disposal area, but now this plant with a wire fence around it and a nice pile of compost sitting on the side is just as bad an ad as some of the incinerators that smoke by day and fire by night.

FROM THE FLOOR: I would like to have your comments on what is being done on a market research.

MR. WANTLAND: I exposed myself to this question and I got it. I may have wished that other members of the Board got it with me. Maybe they will give me some help on it.

This is the singular reason for the formation of the International Disposal Corporation. More specifically, All-State Insurance Company is a wholly owned subsidiary of Sears-Roebuck, by the way. Therefore, when All-State presented this to the Board of the Sears-Roebuck Company, which is the same Board as All-State's, they did it in rather a soft sell method that this process is useful, is practicable and so forth and so on, and we will so structure this that if we salvage, we will have certain income and we find we can get rid of the compost in some other method because of the fact that it has been in effect pasteurized, no weed seeds, non-offensive, therefore can be disposed of in any number of ways.

Of course, Mr. Kishman brought this to the attention of those people. Sears might have ideas of disposing of the material other than throwing it away.

Still, we are in the business to accept this risk and it is a gamble. As I say, I think we found that SACS was unsuccessful in selling plants because the municipality in rare cases, except Milwaukee where Millorganite is marketed, is not constructed to compete with private enterprise. We do have, frankly, Mr. Furlow who was to present this presentation in charge of our product marketing and he does have a staff and does retain others who make market surveys, analyze the market.

As somebody said, it is like back in the 30's and 40's, particularly when they asked Donald Duck, Sr., about how many jet airliners he could sell, how big the market is right now. There were none.

I think it is a fair analysis that we are in some places creating a market. In others there is an existing market to compete with things like peat moss, stable manure, dairy manure for greenhouses.

That is the answer to your question. That is the key. We make market surveys, projects, and we stand behind it financially such that we cannot have the return of such a thing as under-financed companies might have.

FROM THE FLOOR: Will this end up as a Homart item, or whatever it is that Sears uses for its trade name and be marketed that way?

MR. WANTLAND: That is why we set up a new International Disposal Corporation with everybody having an interest. This was partially for ani-trust purposes, too. This is a touchy subject with Westinghouse, but to preclude them from being directly in the business, we set up this organization. We will handle it as International Disposal. We may use a trade name of some sort.

MR. CRANE: Thank you, Mr. Wantland.

Next, Dr. Schulze has a few words to say on some of the work he has done personally. I will turn the podium back to Dr. Schulze now.

DR. SCHULZE: Thank you, Mr. Crane. As you said, I have already been talking quite a bit. This is the second assignment I got at the time we discussed this with the Public Health Service, and actually at that time, the topic was supposed to be the public health aspects of composting, so I did address this part of the meeting today to this topic.

It certainly is an important aspect of the whole composting question and you can make one statement that from a public health point of view, it would be essential for all composting that it should be subject to a high temperature for a time sufficiently long enough to destroy practically all pathogens, or pathogenic microorganisms and higher organisms that could cause disease.

Just exactly how high the temperature should be and for how long it should be held is a question that has to be decided by a specif investigation, and this caused by the fact that the resistance or the time-temperature exposure curve for different pathogenic organisms is very different in each case.

In a recently published study, the South African Council for Industrial Research proposed the following requirements for compost products. They said that any compost containing any animal or any human feces can be considered from a public health point of view only if the following production conditions are guaranteed:

Continuous maintenance of minimum temperature of 140 degrees Fahrenheit or 60 degrees Centigrade for all decomposing material for at least five days. And furthermore, a minimum curing period of 35 days before the compost is released for public use.

These regulations would be specifically enforced if you used such a thing as sewage sludge in combination with garbage to make the compost. This is a very interesting field and all these composting efforts are directed quite a bit to try to include the disposal of sewage sludge with composting operations.

Sewage sludge is very rich in pathogenic microorganisms, as you can imagine -- or maybe you had better not -- so, therefore, the observation of some public health safety regulations is essential.

Now, the regulations put up by these people in South Africa are pretty strict. Continuous maintenance of a minimum of 140 degrees Fahrenheit for five days and a 35-day curing period after that, they are not easy to fulfill on a large scale production. I am not sure whether it is really necessary to use this 35-day curing period after the thermophyllic phase of five days. I think that in this case where they made the study down there in Cape Town that these additional -- this long-term curing was done because they had a high incidence of ascarid eggs. These ascarid eggs -- that is a worm like infection -- they are very difficult to kill. They are the most difficult ones of all the pathogens. This is perhaps why they wanted to impose this 35-day curing period restriction.

They weren't using windrows, but were using rotating drums. Anyway, it seems to me that the requirement of 140 degrees temperature for a five-day duration for all the decomposing material is reasonable and is certainly justified when you want to get a practically full destruction of pathogenic organisms.

There is, as such, no difficulty in obtaining a temperature of 140 degrees in a composting pile. The difficulty exists in making sure that all of the material reaches this temperature and maintains this temperature for a continuous period of five days.

In a windrow operation, I don't think you could do it. In a windrow operation, you will always have an outer shell which doesn't reach the temperature that you reach inside, so that if you want to subject this outer material to the high temperature inside, you have got to turn the pile.

Then, you do this, and then it depends on how often you turn and how well you turn whether you really get all of this outer material inside and whether everything is practically pasteurized.

I feel that the windrow method, as such, does not give you enough of a control to fulfill this public health aspect, and fulfill this public health regulation. Therefore, I have seen many cases where the state health department went into the compost plant where they had windrow operation and took samples and tried to check whether there was a sufficient destruction of pathogenic organisms, using Coliform bacteria or Salmonelli or what-have-you. It showed it was not destroyed. It could very well happen on the outside of the pile so, therefore, it seems to me, again, from this point of view of control, you should have a mechanical composting operation which would allow you to produce this control and maintain it.

One of the essentials that you have to have is a sufficient supply of air or oxygen to the decomposing material, and here a windrow just isn't doing it. It seems to me that you have to have a mechanical composter which would allow controlled aeration of the material and also a controlled agitation of it to obtain this temperature control.

I already mentioned that starting in about 1956 and 1957 I did do some experimentation on air-temperature control for composting and I would like to show some of these experiments, how we did, what we got.

Before I get to that, these are some slides showing windrowing operations in Switzerland. This is merely to show with such high windrows, at least six feet high, you can't obtain much air control.

... Slide ...

This was at the Zurich plant. They maintained some operational schedule. They had these signs out at the pile, and it says the pile was put up in the beginning of April and was turned June 14-15. You can imagine if that was sitting there from April until June when it was turned, this is certainly not a way to supply oxygen and maintain a good temperature control. This is a pretty slow thing.

... Slide ...

This is just in the series. That is the raw garbage, and again the paper, in Switzerland and here in the United States.

... Slide ...

This is an example of windrowing at the Altoona plant in Pennsylvania. They do this under a roof, open sides, but under a roof.

... Slide ...

This is their turning point. They have a Hyde turner. It looks like a snow machine. The compost is pulled in the front by the rotating blade, pulled over and thrown off in back. As you move that along the road, you have it turned.

... Slide ...

This is the same thing. You can see the steam arising from the material. It is turned, aerated, and cooled.

... Slide ...

This is the example from a mechanical composting device used at Wellington, Michigan. They have a stack of four bins and they could slide the bottom out of those bins, and they could drop it in this way, and then they have this air slide to each bin. These are the bins here just to demonstrate one way of handling this. There are many different ways.

... Slide ...

This is a diagram of the experimental setup that we use to do this automatic temperature and air control thing. The idea was, as I already mentioned before, if we stick a thermostat into the composting material and set it so that it would close the solenoid valve at a maximum temperature, then I think it would operate in the following manner:

Suppose we set it at 140. Then, the thermostat closes the solenoid valve in the air line. That would be over here, and that would shut the air off.

Now, then, the organisms are going to use whatever oxygen they have at the time. It will be gone in maybe five or ten minutes. Then, the heat production will decrease in the compost. The heat loss from the unit will bring the temperature down. The thermostat will register this, and let's say at 138 or so it will open up the solenoid valve, the air will flow again, and the organism will produce heat, the temperature rises, reaches 140, solenoid valve closes, and we have got an automatic air and temperature control and we don't have to do anything.

This is what we set out to do. We had a batch operation, a round tank filled with the decomposing material over there, the thermostat, the solenoid valve, the air inlet, the recorder for the air flow, the recorder for the temperature, and what we did, we established first what flow of air we were going to use. Let's say we did find out in order to maintain thermophyllic reaction, you would have to supply 14 cubic feet of air per ton per minute of volatile matter or organic material in the unit. Say you have that established, you do use this flow of air and then you start operating automatically in this manner. That is what we did, and I think our next slide will show that.

... Slide ...

This is a reproduction of that air flow recorder chart. What it does show is that we were using a flow of eight cubic feet of air per minute in this case and the first action started down there at about 4:30 p.m. All of a sudden, the unit reached a maximum temperature -- I think we set it at 115 in this case, so it shut off and then the solenoid closed the air flow. Here was the air flow, continuous. Here the thermostat shut off the air, air flow nil, for about 20 minutes. Then, the unit cooled down, the thermostat opened up, the air flow started again for maybe 30 minutes, then the heat was reached, shut off; on, off, on, off, and so on for the 24-hour period.

I can tell you it was quite an experience to have the unit sitting there in the laboratory and hear the loud click of the solenoid valve on and off, on and off, just directed by the heat production activity of the bacteria in the compost. We didn't have to do anything more. We just sat there and watched it click.

... Slide ...

The next slide shows an analysis of the on-off period in this automatic cycle. It shows that in the beginning we have a very short period where the air flow was actually on. It was on the first day two to fifteen minutes, and the second day went four minutes, the third day one to five, and so on until the ninth day when it was on four to two. On the tenth day, the solenoid didn't work any more. It stayed open.

What it says here is that a short period of aeration, from one to ten minutes of air flow was enough to increase the temperature in the unit from 138 to 140, let's say, and close off the thermostat. They heated up fast. It took a longer time to decrease the temperature because the off periods were, on the average, time in minutes over there, eleven minutes, and then nine, six, eight, five, three, twenty-one, twenty-three, twenty-nine in the second half.

In the first half, turning the first cycle, we had five to ten minutes to cool off and start the air flow again, and later on it took longer, twenty-one, twenty-three, twenty-two, twenty-nine minutes to cool off the unit.

What the automatic recording system showed us was that in a fairly short period of air supply, within, let's say, two to five minutes or three to five minutes, you bring up the temperature high enough, then it takes about five minutes or five to nine minutes to pull it down during the first phase, and it takes about twenty to thirty minutes to pull it down in the second phase, so from here on, there is a longer period.

We didn't have any mixing in this experiment. It was just a can filled with the material sitting there and it was well insulated, so it seems to me the conditions might change between what you would have in the unit with mixing and maybe with no extra insulation so, therefore, it may well be that when you do this on a larger scale, you will get a quicker cooling off period and then you might have the air on, heat going up and cooling off, and might be about equal.

This depends on operating conditions. Anyway, the system worked pretty well and we got a very closely controlled, automatically controlled temperature in our experiments.

This was done in 1956, 1957, 1958. Later on, I think during the year 1963 and the year 1964, a similar automatic control system was developed in cooperation with Fairfield Engineers, doesn't work quite along the same lines, but very similar, and we found that it can be worked out on a large scale and we do get an automatically controlled temperature that we can set at any range and it will maintain itself. We recorded it.

I feel that this, in combination with the idea of continuous thermophyllic composting, does bring the composting process from this phase of an old outmoded method into a phase of controlled scientifically operated technology where you have more reliability, and I think this point has great importance in relation to the public health aspect of the process because you want to make sure that the product that you have does come out where practically all the pathogens are killed so that you can sell it and it can be used for produce, even garden produce, if necessary.

MR. CRANE: Thank you, Dr. Schulze.

In the interest of time, my 20 minutes will be cut down to about 30 seconds, I hope.

One thing that is included in my outline is the project that the Public Health Service is undertaking in the field of composting, a co-operative effort with the Tennessee Valley Authority, where a pilot plant will be built down in their area. The Public Health Service will be studying the pathogenic survival aspects of composting, and the Tennessee Valley Authority will use their resources to study the agricultural aspects. I am not sure that there has been a starting date set on that.

Ralph Black is shaking his head no. It is still in its initial stage.

I think we will open this up. We have 20 minutes to open up the questions for any of these gentlemen up here.

FROM THE FLOOR: I have heard the statement made this morning and several other times -- the claim is made that all the pathogens are killed. Isn't it true that we don't know how many are killed in fact, that this has never been really fully tested?

MR. CRANE: My paper did present an exact statement and this is where it stands now. It hasn't been definitely proven, particularly with the use of sewage sludge, undigested, being added.

Do you have any comments on this?

MR. HOUSER: We have operated for a period of six weeks with raw sewage sludge and we found that -- on one test, we found that we didn't have any pathogens that were still alive. However, it is possible that we didn't check through all of them either, I don't know.

FROM THE FLOOR: Do you consider one test valid?

MR. HOUSER: No, no, I do not. We have had tests other than that, but not on sludge.

In other words, we have tests which we have made so far showing no pathogens. This does not necessarily mean it is final, at least I would say so.

MR. CRANE: Dr. Schulze, do you have anything?

DR. SCHULZE: These people in South Africa made a specific point studying that, this pathogen survival. The result of their study is just a kind of a recommendation or a regulation that they are trying to put up over there that I mentioned before, and they took as their indicator these eggs that I spoke of before that are so hard to kill. In fact, when you get them destroyed, you have all the others destroyed, so what they came up with, they said in order to obtain this goal, you have got to have at least 140 degrees for 5 days, and after that, a 35-day curing period.

I wonder about the 35-day curing period. My point, though, is that we are going to get to some kind of an accepted agreement on this, but it does need more work. I think that is as far as probably time and temperature is concerned for the thermophyllic stage. We are not far from an agreement at all.

What then comes is this after-period. That is something that I am not clear on.

FROM THE FLOOR: One additional comment. Larry, it seems to me that the health departments, Public Health Service -- perhaps we are all guilty of this -- do not have any standardization. Perhaps it is too early, but it seems to me we are in the same boat, we are going along the same line as the air pollution folks and the incineration folks. We don't have standardization, standard checks for checking compost. We don't have standardized data on air pollution. I expect you will find that one state will use one set of standards and another state will use another.

MR. CRANE: I think we will all agree with that.

FROM THE FLOOR: I would like to ask this question to the whole panel. I am just wondering what their feeling would be if -- whether they could use animal waste, manure from dairy plants, dairy farms, and hog plants that would be in the area around the city, if they could use this manure and a hydrogen source which is about 35 per cent solids, or 75 per cent moisture, if they could use this in the composting plant, whether this would help the process, and also whether they would accept this quantity, whether it would help the process and then would the charge be the same as that of garbage.

MR. CRANE: Mr. Wantland, can you answer that question? Your process did try this at one time, didn't it?

MR. WANTLAND: Our process, because it is not closed and you do reach the temperatures for the duration we talked about, we feel it is an acceptable process for disposal. We have not had the extensive experience because we have not solicited it. We have always proposed a total solution for garbage and refuse as defined and picked up. It can be added, I think. Others have had much more experience than I am aware of our company having specifically had, but it can be accepted. I know we have done it in many cases. The only problem is making sure it is incorporated fast enough for it to be properly aerated before it would go anaerobic.

MR. BROWN: On that point, the answer to your question is yes, it can be assimilated into the garbage in very substantial proportions. As far as the price, it is a negotiable item, but there is no real basic problem as far as handling it.

FROM THE FLOOR: It is lower than garbage?

MR. BROWN: Yes, it should not override the garbage part of it, but it certainly works up to 50-50 proportions all right.

DR. SCHULZE: I would say that in the first place, the first consideration would be moisture with quite a number of those wastes. In other words, when you are through mixing your material, your raw material, when you prepare it for the composting process, you want to make sure that you don't get above 60 per cent moisture because from then on, it will be very difficult to aerate, as these gentlemen will certainly verify.

There is maybe an initial step necessary for sludging, for instance. They have too much water. Others may not have. That is one consideration.

As far as implementation of nutrients, nitrogen, and so forth, I think it can only be beneficial unless you go to the condition where you have nothing but this, but I think what it will come to is always a mixture. What you have is garbage. It contains too much paper and cardboard anyway, which brings up the carbon ratio too high, so any addition of this more nitrogenous material should be beneficial.

MR. HOUSER: I have seen animal wastes such as manure from cattle windrowed and composted very successfully, that is, only with the bedding material. I think if they can do it in the windrow, we can do it in the digester.

As far as trench manure, our dewatering equipment can get that down to 60 per cent moisture and it can be mixed in the digester and can be composted with garbage.

FROM THE FLOOR: May I add to that and ask a question? Several years ago we were called into one of the leading stockyards in the northwest with the idea of incinerating this waste. Well, one look at it, incineration would be about the most expensive way of getting rid of it.

I discussed with the manager giving it to the farmers. He said they wouldn't haul it, they want us to deliver it, spread it, and so forth.

I asked why. He said they took the analysis to the farm agent, got it mixed up, ran it in a standing tank and got it spread.

We came up with the idea, since we are not interested in anything but managing the incinerator, for this man to contact your predecessor and ABC, he contacted both SACS and the plant at San Fernando, California, and at Phoenix, Arizona. I told him one thing I had heard. It would have to be dewatered, but having had experience handling slop, it wouldn't be too much of a problem. He agreed he could dewater it.

The man went out. He talked to whomever was in charge of both plants and none of them would take him on. He was even willing to underwrite it to get rid of the stuff.

Now, if any of you gentlemen would like to know the name of this, I would be glad to give it to you after the meeting. I would like to have a comment of why -- why did they go this way? I know you can't answer for them, but what would be the reason? This looked like an ideal thing to compost.

MR. HOUSER: I don't know. It looks good to me. We have not had any available and we have not put it in, but we would like to try it.

FROM THE FLOOR: Quite often you hear something about the carbon-nitrogen ratio being important in the compost. I wonder if Dr. Schulze would speak to that point.

DR. SCHULZE: It started with the investigations at the University of California at Richmond, at their laboratory in 1950 to 1955, and until 1958, and what it means is this: If you try to characterize the mixture that you are composting and you analyze it for carbon and nitrogen, you will find that obviously the more carbohydrates you have -- let's say the more paper, cardboard and stuff is in there, for instance, the more carbon you will find in relation to nitrogen. this is supposed to be a weight ratio between carbon and nitrogen in the mixture.

Now, if you set nitrogen at one, then this ratio will always tell you how much more carbon is in the mixture than there is nitrogen, based on N equals one.

Now, they were checking what composting process would do when you shift these ratios, and the results were, as I remember these, if you have a finished compost, you should have something like a twenty to one ratio. In other words, there would be twenty pounds carbon to one pound of nitrogen in this mixture. This, if you put it in the soil, will not do any harm. In fact, it will be beneficial as a soil builder.

Now, if you look at the raw material that you start with, you might have anything on there like thirty pounds of carbon to one pound of nitrogen or thirty or forty or fifty or sixty or seventy. They did say that the more carbon you have there, the slower the process gets, the composting process, and if you go up into a fifty to one carbon-nitrogen ratio, you have reached just about the limit. Anything above that is hindering the composting process more than it does anything else, so from then on, it looks as if you have to add nitrogen in order to get good compost.

MR. CRANE: The high ratio also does not make it a very good product when it is used. It does not tend to rob the soil when it is used.

DR. SCHULZE: It is very difficult to bring it down to the twenty-to-one ratio.

FROM THE FLOOR: I have sort of assiduously been avoiding the real problem with composting and that is what you do with it after you have made it. Some of us are rather critical of the composting business because this hasn't been explored fully enough.

Well, it has been a complete failure today as far as solving the problem of disposing of the tremendous amounts of material that you get without really reducing the volume. That is a big problem that faces us in this solid waste or in any solid waste program.

One family produces 4000 pounds of trash in a year. What are they going to do, get rid of 1000 pounds of compost a year?

With urban communities like Franklin County and Montgomery County, you get to the place where there isn't anything to put compost on except a few patches of grass and a few farms. We make enough compost in that one area to completely saturate that county and many around it, and if you fellows are successful -- and I hope you are -- the problem of composting piles up on itself. If we build a composting plant in Montgomery County and build one in Franklin County and build one in Cleveland and build one in Toledo, where does all this stuff go?

MR. CRANE: I think this is pretty obvious. I am sure these fellows will agree that everyone will probably never convert to composting.

DR. SCHULZE: I would like to say something here. I didn't have time to talk about it. I knew it would come up. This is more or less something that I do for future work, maybe discussions. It is what they do in Holland with it. They produce compost on a large scale. If they handle 35 per cent of all refuse in the country, they must have some compost and they sell it all. This goes some place. In fact, composting is the one operation in this area where the stuff finally disappears. It disappears, it goes back into the land and into the soil. You don't have residues there that you have where you need another dump to put stuff that is left over. It goes back to where it came from.

Now, there is a paper by Mr. Tensmak who seems to be the director of this Holland composting organization, and he put the paper in the Journal of Compost Science. It was the last issue before the new one.

He described in there where the compost goes that they make in Holland. They had a production in 1959 of 194,331 tons. In 1963, they produced 203,000 tons, metric tons, and that was all sold.

He has a list showing by percentages where this compost goes. In 1959, it went here, and in 1963 it went there. I will just read 1963. The crude compost, the crude type, was spread on the fields, was sold to agricultural enterprises, farmers, 23.7 per cent. Previously that was much more.

Horticulture, glass houses, orchards, garden produce, and so on, 44 per cent, almost half.

Recreation, public parks, golf courses, sports fields, highways, 36.6 per cent.

They found that the higher quality compost was the one that could be sold. Part of it actually goes into nurseries, gardening, and the other half goes into parks, recreational areas, lawns, highways, and so on, so there seems to be a possible use for it.

MR. BROWN: I have a comment that I think bears directly on your question. About a year ago, we conducted a complete market survey around the Dayton, Ohio, area. We picked out nine counties. We surveyed them for their entire agricultural development, for everything they put out, corn, peas, wheat, rye, and so forth. This was in conjunction with our own staff, with the Ohio State organization, and every county agent in the nine counties. We took a circle of fifty miles around Dayton and evaluated the complete output of compost as being generated out of Montgomery County and came up, without any question whatsoever, the area of fifty miles around from downtown center of Dayton, Ohio, will absorb every pound of compost that is generated in Montgomery County for the foreseeable future beyond ten years. This was complete agreement that there is no question about it.

This is on the basis that we only market it there and don't send a pound outside that area. This must be done by education and so forth.

Incidentally, the state of Ohio is in a condition where its organic content of the soil is in a very sharp decline and has reached a point where the agronomists are definitely concerned about the fact that the decline will continue. The only reason it is declining, of course, it is being pressed with the concentration of chemical fertilizers. Eventually, you are going to have to replace the organics in the soil or you will have marginal soil.

The only place to get it is not to burn the organics, but convert it in to a useful product and put it back in the soil. It doesn't go on the basis of putting a few pounds per acre on, but it goes at the rate of tons per acre and it is being sold at a price where you can talk about tons. You are not talking about terms of a lot of money, but a few dollars per ton.

MR. WANTLAND: If I can make one additional comment, and it may be contrary to my associates up here, but as I said, the original premise started fourteen years ago and is valid today. This will not solve the world's problems. We are in business to make money. Where the economics will allow us to do so, we will operate and serve a purpose.

The thing that I may say that may not be too well accepted up here, it is quite possible that someday you will see us go arm-in-arm with incinerators and we will have plants side by side where certain materials are more conducive for incineration and other materials for composting and they will be separated and each will go its separate way. I don't mean segregation at home, but from commercial roots and this sort of thing. I don't think any of us intend to compost the world. We did need to recognize this possibility.

FROM THE FLOOR: I would like to make an observation along with this, and then you folks may comment. We heard yesterday in incineration about 80 per cent of the material by volume being reduced down 85 per cent to about 15 per cent. In other words, we still have 25 or 30 per cent of the total volume of solid wastes that were collected that we must dispose of in the landfills.

We heard today that composting will take about 78 per cent of the initial volume and will reduce this down to about 50 per cent. In other words, we still are ending up with 45, 50, or 55 per cent of the total volume of material after the composting.

Could we consider that we could use composting as an alternative to incineration in order to save land for landfill in cases where we cannot use incinerators for air pollution reasons, and in this way make our landfills last longer?

If we could do this, the question that would come to you gentlemen, could we design composting operations in which we could not try to produce a quality product, as you are doing with your grinding, your screening, and your packaging?

MR. BROWN: I think there is general agreement on that point. The whole science of waste disposal is to break the thing down so that you are using the most logical one for each category. We are going to burn some things. There is no doubt about it. You are going to landfill some things because there are a lot of things you can't burn and they are not going to compost.

Then, there is another area where we are going to compost because it makes sense to convert it into a good organic proposition which can do us all some good, so it is going to be a matter of spreading the thing around a little bit by doing it so that the mechanics of it will make sense, and economically it will make sense.

We have the ideas, but it takes a lot longer to explain them and generate the thinking along these lines.

MR. CRANE: We are going to cut this off.

This evening we will have the movie and possibly some of you gentlemen can stop back at the time of the movie and if anyone is interested in talking with the panel at that time, it can be done.

WEDNESDAY AFTERNOON SESSION

MASTER REFUSE PLANNING

The Wednesday afternoon session of the Seminar convened on September 22, 1965, at 1:00 P.M., Mr. Rosendahl presiding.

MR. ROSENDAHL: Gentlemen, this afternoon we start off with a little different approach to the program.

In planning this program, we were very much concerned about bringing this home to you people who are involved, and this is in the field of planning, master planning.

We have with us today a gentleman from one of the large consulting firms of the United States, quite well known throughout his area. Mr. Bremser is a civil engineer, a partner in Black and Veatch of Kansas City. After receiving a degree in civil engineering at the University of Illinois in 1941, he joined Black and Veatch and also served as a line officer in the Navy from 1944 to 1946.

He has served as the principal engineer, project engineer, on many water works, sewage and water works installations, and not only in this country, but also throughout the western hemisphere and also in other parts of the world.

Of particular interest in connection with this, it is well to know that he has had to do with refuse disposal problems, those being in El Paso, Houston, Kansas City, Los Angeles, Greater Winnipeg, Milwaukee, Pomono, Seattle, Springfield (Massachusetts), and Wichita.

I would like to present to you at this time Mr. L. W. Bremser of Kansas City.

A master refuse plan is a comprehensive plan for dealing with refuse from its source to its final disposal. A master plan must be based on facts developed from engineering analysis and evaluated to a logical conclusion. Generally, the refuse problem may be classified into three phases, collection, haul, and disposal. Depending on the particular situation, other phases may be involved. The type of refuse collected has a definite effect on the method of disposal and the hours of collection and effect the cost of haul. For example, building demolition debris cannot be incinerated without separation. Heavy tree refuse cannot be burned in a refuse incinerator without pre-conditioning, nor landfilled properly without burning.

Collection hours which require hauling during rush hours slow down hauling speed and increase the cost. The distance to disposal sites may have as much effect on cost, or more, as disposal methods. Since all phases are inter-related, the entire problem must be considered as a system.

Any approach less than a total system concept is not a master plan.

Considering that reported costs are from $10 to $30 per ton to collect and dispose of refuse, on the average, each person produces about half a ton per year, and that 70 per cent of our population resides in urban areas, the total expenditure in the United States for refuse collection and disposal is in the range of two-thirds of a billion to two billion dollars annually. This expenditure does not include the costs associated with the bulk of industrial refuse, abandoned and scrapped autos, dead trees, building demolition debris, and that sort of thing.

In view of the enormous annual expenditure, it is only reasonable that master refuse planning be considered as the basic part of any overall area plan.

Historically, refuse disposal has been the stepchild of municipal operations. The cost generally has been met from general tax levies which could be used elsewhere for improvements that would be more impressive to the taxpayer. Consequently, the refuse operation is often under-financed.

Master planning for refuse is unknown in many urban areas. This is at least partially due to the fact that refuse can be collected and disposed of without an engineered plan. Results of an unplanned operation may not be optimum from the standpoint of sanitation, esthetics, service to the public, and economically, but the job can be done. In recent years, however, a number of larger cities and metropolitan areas have realized the magnitude of the refuse problem and the need for engineering analysis to develop long-range plans for all or a portion of the refuse operation.

Numerous studies have been made for this purpose in the last five years and there is a rising interest in refuse planning.

Unfortunately, accurate basic data for planning are not readily available for most refuse operations because the operating agencies have not maintained meaningful records.

As an item of useless statistics, I did a little figuring sometime ago and if we were to fill the baseball stadium in Kansas City with refuse collected within one year's time, the refuse would be 100 feet deep in the stadium.

Likewise, wide gaps exist in reliable design criteria for refuse facilities reflecting the general dirth of engineering research and planning in the field. Reported costs of refuse operations are often misleading because of the lack of uniformity in accounting methods and that basic elements of cost such as debt amortization, supervision, and overheads are frequently omitted. For this reason, casual comparisons of cost for different communities often generate more heat than light.

The picture regarding basic data and information is becoming brighter. More communities are realizing the importance of good records to guide future planning and numerous private and governmental agencies are conducting surveys in research to develop useful design criteria and planning guides. In addition, some universities now include courses in solid waste disposal in their sanitary engineering curricula. As our society becomes more affluent, the amount of discards increases.

A few years ago, the major portion of refuse was waste food products or garbage. Now, with the advant of frozen, packaged, and canned foods along with home garbage grinders, kitchen refuse has become largely the material in which foods are packed.

A few years ago we were doing some work in the city of Milwaukee, Wisconsin, and the gas company was putting the hard sell on the gas-fired home incinerator. We were getting the sales talk on the household garbage grinder. Actually, the incinerator, anyhow, is an expensive item and a high maintenance item. We weren't considering this thing very seriously, but we stopped in to see the Commissioner of Health, and brought the subject up. He looked me in the eye and said, "You know, we have people in this town who can't even keep a toilet operating and you propose to put in incinerators and garbage grinders."

I think we need to take this type of look at things. Even Jasper, Indiana, doesn't have 100 per cent garbage grinders.

No longer is garbage a problem of any magnitude in urban areas. Formerly it was necessary to design incinerators to burn a large percentage of wet garbage. Today the problem is completely reversed. Refuse has an extremely high heat content and the problem has become one of providing adequate heat release facilities. A major factor is the large amount of printed material for disposal such as newspapers, magazines, and throw-away advertising.

Major factors in collection are the frequency and scope of service provided. Frequency of collection may vary between cities. If no putrescibles are present in the refuse, it can be stored by the householder for long periods of time. If putrescibles are included, a schedule of at least weekly collections must be maintained and in warm climates it will be necessary to collect more frequently. Large city refuse operations began in the days of the horse drawn wagon. In those days, labor was cheap and garbage collection was a favorite place to put people to work to pay off political obligations because much labor was available, and uneconomical practices became established in some cities such as collecting refuse from basements and returning containers, and so forth.

As a matter of fact, in one New England city where I looked at the refuse collection operation a few years back, they used stake body trucks, and they had a crew that looked like a WPA project. I believe there were about eight collectors on the crew, two guys up on top of the truck, and two guys would go down in the basement and carry the stuff out, and two more guys would be coming and two going at all times.

With the high cost of labor today, the trend is away from such personal service and toward standarized operation. In general, commercial refuse is collected in much the same manner as residential, except that the frequency must be adjusted to suit the need. The collection point is usually at the rear of the establishment, although in at least one city of my acquaintance, the collectors carried keys and naturally entered the building after business hours to collect refuse.

Most cities make no attempt to handle industrial refuse. Each industry must make arrangements with a private contractor for refuse collection and disposal. Many cities control refuse contracts through licensing and many exercise no control. It is becoming more and more essential, however, for the larger communities to exercise rigid control over disposal, whether by contract or otherwise.

Transportation is the movement of refuse from the collection route to the disposal site. This can be accomplished either in the collection vehicle or in large capacity transfer vehicles. Transfer can take place at permanent fixed transfer points, or on the collection route by the use of special equipment.

In the past, when refuse was collected on the route in horse drawn wagons, it was often transported to a disposal site by railroad car or some similar means because horse drawn equipment could not go very far economically and a transfer haul was common.

As an example of a rather unique transfer haul, I am told in one Latin American city streetcars were used in off hours when they were not needed for transportation of people. Wooden gondola streetcars were loaded with refuse which was transported to disposal sites outside the city. This doesn't sound like a particularly sanitary system, but it certainly provided a good load factor.

When the motor truck came into general use for refuse collection, the practice of transfer was generally abandoned and motor trucks delivered the refuse directly to disposal sites.

In recent years, because of increasing haul distances to disposal sites, delivery of refuse to central locations and transfer to large vehicles has become increasingly popular again. A number of equipment manufacturers are producing transfer equipment to take collected refuse and haul it to disposal sites.

No method of refuse disposal is less costly than open dumping. It is still being done in most small towns as well as in a number of our major cities. In many of these cities, the dump is burned under cover of darkness with the hope that the fire will be out by morning. A number of cities have faced up to the problem of air pollution, rodents, and general nuisances associated with this disposal method and went to sanitary landfill operations or incineration.

In a number of large and a few small cities, incinerators have been constructed since early in the century. Many of the incinerators constructed a number of years ago were abandoned because of smoke and odor nuisances and because of the high cost of auxiliary fuel for burning wet garbage. Much improvement has been made in incineration, and technical knowledge is available for much more improvement in the future.

I was visiting with a council in the western part of the United States where we were making a study of the refuse situation and they had a councilwoman there, a very nice lady. She said, "Mr. Bremser, do you mean to tell me if we put in an incinerator it won't discharge anything into the air"?

I said, "No, I didn't say that. I did say that the flue gases could be cleaned up so that the effluent would be in better shape than most of the industrial stack effluents that are going into the air here in town, and in addition to that, this incinerator would have 175-foot high stacks which would get the effluent off the ground and really most of the air pollution you notice is probably from motor cars operating at street level."

She looked at me and said, "Yes, but I live on the seventeenth floor." That stopped that.

The changing quality of refuse has made incineration feasible without the use of auxiliary fuel. Awareness of danger of air pollution has prompted the development of more efficient incinerator designs. The high heat content of present day refuse makes heat recovery increasingly attractive when incineration is considered.

Composting, as a third method of refuse disposal, has been tried many times in the United States. Technically, as we heard this morning, composting is feasible, but we still have not seen a commercially successful operating installation in the United States. Most composting installations have been promoted by private business. Obviously, a process which can reclaim a soil conditioner from refuse sounds attractive, but caution must be used in evaluating a method with such a consistent record of failure. It would seem desirable to cease thinking about composting as a solution to the refuse disposal problem, but rather as a supplemental adjunct to it where the local conditions are favorable.

The population has been migrating toward urban areas. The rural population is decreasing while urban population is rapidly increasing. As the urban area grows, close-in land becomes more valuable. The haul to distant sites is costly, but since few analyses of relative costs are made, disposal facilities usually are forced farther and farther into the hinterland. Perhaps we can awaken the decision-makers to the urgencies of the situation before all the reasonable sites are gone.

Almost always disposal sites are difficult to obtain. In addition to site acquisition, getting refuse to the disposal site must be a problem. The householder rightly feels that heavy truck traffic should not be routed over residential streets, and garbage trucks are particularly objectionable. Though it may seem to be of minor importance, delivery of refuse to the disposal sites over routes where hauling is not objectionable may be a major factor in site selection.

Contract refuse operation has been popular in recent years in rapidly growing urban areas where municipal services are poorly organized or nonexistent. There are good contract operations and there are poor ones.

Often we have contract operations proposed as a panacea for all city problems. Experience indicates that extreme caution must be exercised in preparing contracts, that a municipality can only afford to deal with people of the highest integrity and the contract must recognize the rights and the interests of both the municipality and the contractor in a fair and equitable manner.

We must recognize that in many instances Civil Service red tape and stingy budgets can hamstring a municipal operation. On the other hand, a contractor must make a profit on his investment and pay taxes so that he must operate more efficiently to provide service at a cost comparable to that of a municipality.

The refuse problem has been used in many instances as a political football. Despite the fact that results from objective analyses are necessary to the proper planning of refuse operation, the decision to act is often governed primarily by political considerations.

The average citizen recognizes the need for refuse removal and disposal, but he is not at all in favor of having the operation carried out within his sight. Rather than face up to this attitude, elected officials are prone to look for the easy solution by moving the disposal site farther away. Eventually, the facility reaches the limit of the jurisdiction concerned and the residents of the next jurisdiction are rightly opposed to receiving refuse from elsewhere for disposal. This situation is often the factor which finally brings the municipal administrators to the realization that a master refuse plan is needed.

There is nothing complicated about refuse planning. Naturally, good, accurate, basic data are essential to good planning. However, gathering data costs money and for that reason many decisions in refuse planning are made without benefit of facts.

One example comes to my mind which occurred recently in one of the major cities of the country. During the last election, the mayor and council used the refuse disposal situation as a campaign issue. Their promises to the voters called for the elimination of all dumps and landfills and the construction of incinerators as a total solution to the refuse disposal problem.

Shortly after the election, an engineering study was authorized along with a selection of incinerator sites. The report recommended that additional landfill sites be secured for the disposal of incinerator residue. This created a somewhat embarrassing situation for the newly elected officials.

In planning, first it is necessary to get recognition of the refuse problem as being worthy of technical consideration.

Public officials must be made aware of the need for spending the time, effort, and money for thorough analysis. Using the data from such analyses, a program can be formulated based on facts. Even thorough analysis of a problem will lead to a theoretical optimum solution, the final program will usually involve compromise. This may result from the inability to replace unsuitable equipment because of investment, the inability to obtain theoretically proper sites, or to political factors around which the system must be designed.

In most instances, it is not possible to obtain the optimum solution. For intelligent planning, certain basic data are necessary, depending on local conditions and available collection and disposal alternatives. A plan will formally be based on some or most of the following elements:

Item A. A reasonably accurate determination of the present quantity and composition of refuse, its seasonal variations and the geographical distribution of its generation.

Item B. Projection of future refuse quantities. This requires a determination of whether or not commercial and industrial refuse will be handled by the program.

Item C. The evaluation of physical and economic feasibility of various elements of the current refuse program as compared to available alternatives, taking into account all costs.

Item D. Estimate of the remaining life of present disposal facilities.

Item E. Estimate of disposal capacity required for a period into the future, usually at least twenty years.

Item F. Evaluation of possible disposal methods to meet the needs of the community for the study period concerning economics, public health aspects, nuisance potential, and public acceptability.

Item G. Evaluation of collection systems and methods to determine the most economical and satisfactory methods consistent with the degree of service required by the public.

Item H. Consideration of the relative merits of direct haul in a collection vehicle versus transfer haul.

Item I. Evaluation of the possibilities for salvage, and in the case of incineration, of waste heat utilization.

Speaking of salvage, several years ago when we were working in Los Angeles, I got to know a fellow by the name Randalls who was a sort of public relations man for the Los Angeles By-Product Company, and they are big salvage people in Los Angeles. He told me one day, "You know, we decided at the church a month or so ago we needed to raise some money, so I proposed that we have a paper drive. We rented a big van and parked it in the church parking lot and we sent all the kids out and they grabbed paper everywhere they could find it. About ten days later, they had this truck just piled full of paper. You know, when we went down to sell that paper, we didn't make enough money to pay the rental on that truck."

This salvage thing is a real fluctuating item.

Item J. Evaluation of various combinations of collections, haul, and disposal alternatives to arrive at the optimum overall refuse program.

Item K. Development of complete estimates of capital and operating costs for the various elements of the optimum refuse program, and for other alternatives, if necessary.

Item L. Outline of method for financing the proposed program.

Item M. Comparative evaluation of municipal operation with contractor or private operation of the refuse program or certain phases thereof.

Item N. Compilation of the results of the studies into a formal report which shows clearly the refuse problem, the available alternatives for dealing with the problem, evaluation of these alternatives, and the recommended program.

Last, presentation of the proposed program to officials, interested civic organizations, and the public to inform them of the problem and the justification for the recommended program; to answer their questions and to gain their support for implementing the program.

Certain limiting criteria are applicable, and I will just suggest a few. It is necessary to plan so that major haul routes may use major truck thoroughfares or freeways. This is obvious on the surface, both from the esthetic and the cost of haul standpoint.

Locate additional disposal facilities only in an area where it will be compatible, such as in an industrial zone or a permanently isolated area. Non-conforming use is not satisfactory. For example, in one of our major cities, an incinerator was located in a residential area because the site was available at no cost to the city; although the plant is able to meet air pollution standards, the people complained. If the plant had been located in an industrial zone, one more stack would not have been noticed.

Another item is this: Don't get too far away from the immediate problem. The residue from any disposal process must be returned to the earth. This suggests that when we are talking about processing methods, the method producing the least residue may in the long run be the best method.

Another item. Disposal facilities should be located within or close as possible to the area served. This is obvious.

An important item that is forgotten all the time, and I don't know why: Remember amortization of equipment and facilities, employee fringe benefits, and overhead may represent a substantial part of the cost of a refuse operation. Planning which fails to recognize all major costs will produce fallacious conclusions.

Among municipal operations, none is closer to the public than refuse. Public relations should be carefully considered in the day-to-day operations of the system. Neat, clean workmen and equipment on the route are essential. Enforcement of container regulations are necessary, particularly on curb set-outs.

Scheduling of hauls should be timed carefully to avoid bunching of equipment.

Above all, the disposal facility must be kept in good condition so that it makes a good impression on the public. Complaints must be promptly and courteously handled.

Once a master plan has been formulated, every opportunity must be taken to explain the program and the facts on which it is based to all interested civic groups.

Most municipalities have recognized the value of the city plan. Many of the city plans seem idealistic, but they provide needed guidance and direction toward which to build. In the past, few such plans have considered the refuse problem to be of sufficient import for inclusion. This is natural since the problem has grown with the community and only a few communities have realized that there was a problem until recent years. The cost of refuse removal and disposal has increased until it has become a sizeable part of the municipal budget. Industry, which in most municipalities must provide for its own refuse disposal, is experiencing the same increase in cost as the city.

Unless attention is given to this problem, the cost of disposal of wastes may become an important factor, as important as taxes, utility rates, and shipping costs in the attraction of new industry.

Increased cost, lack of needed disposal facilities, the long-ignored needs of industry, concern over air and water pollution, and public opinion as expressed in the press have created a new interest in the problems of refuse disposal. Only through intelligent master planning, based on facts, will proper solutions be found.

I don't know whether anyone has any questions. I think we have right now some time to answer any you might have.

FROM THE FLOOR: I have a question, Mr. Bremser, I haven't really formulated my question too clearly, but maybe I can get it out here.

What is the proper approach, the planning commission or the public officials -- what is the approach that should be taken in presenting the problem to the consultant in all these phases you have talked about where you are investigating the possibility of various disposal methods and cost analyses?

If it is not prepared carefully, I can see a problem in the consultant reaching a conclusion that maybe incineration is a proper procedure before he should arrive at that decision. After all, how much is he involved in landfill development and so forth?

I am not accusing you of anything, but I can see a problem here.

MR. BREMSER: Let me say I think rather definitely when a prospective client determines that it is time to do something, the most sensible thing for him to do is call in an engineer and sit down with him and discuss the problem, pro and con and let the engineer determine what needs to be done.

I have had this happen that a client comes up with a scope of work which he thinks he needs and appropriates a sum of money for it, and the sum won't come anywhere close to doing what he needs done, but I think you need a pretty close liaison between the client and the engineer to be done in the prospective plan and how much time and effort it will take to do this.

The average client that I run across doesn't know what he needs. He doesn't know enough about it himself. That is why he is calling us in the first place and that is why you have to sit down and discuss it quite frankly.

FROM THE FLOOR: In most cases I imagine, the health department tries to sell you a client when there is a need for refuse disposal. How do we go about doing that?

MR. BREMSER: I don't quite get your question.

FROM THE FLOOR: A lot of municipalities, towns, counties, and even states don't realize that this problem exists, the politicians, for example. How do we approach these people and sell them on the fact that they need this service?

MR. BREMSER: Well, I can't think of a better way to do it than to try to get a lot of these meetings of maybe a lot shorter duration, half a day or a day, around the country and invite the politicians and the local people who do have the power of yes or no over these things and point out to them that there is a problem, and that there are possible solutions.

I think this is the place where the Public Health Service might well spend some of this money that is coming along under these new laws.

FROM THE FLOOR: We are just mean enough when some of the local citizens down there complain, we invite them to call the County Commissioners or the City Commissioners and let them personally inform the public officials of the problem. I think if this sort of thing goes on enough, you will soon educate some of the politicians to the fact that there is a problem that needs attention.

MR. BREMSER: A good point.

FROM THE FLOOR: The question was raised a moment ago, one of our standard statements when someone does get to this point and the County Commissioners or someone says, "What do we do now," we say, "We suggest that you hire yourselves a competent engineering firm to make a feasibility research to see how much garbage there is to be disposed of and then you can start from there."

FROM THE FLOOR: To your knowledge, how many, approximately, cities that you have had contact with have a master plan so that they know what they will do in five years from now and twenty years from now in the matter of the disposal of the refuse?

MR. BREMSER: Well, of cities I visit for all reasons, very few, but we have done master plans for a half a dozen or so. We have done parts of them for others. People are only interested in disposal or think they should build an incinerator and ask us where it should be placed. I tell them, "You are getting along on this landfill, just clean it up and you would be in pretty good shape."

There aren't very many that really have a master plan.

FROM THE FLOOR: With the advent of the public law requiring, as of July of this year, that all cities over 50,000 have a master plan for not only highway planning, but all other aspects of planning, this is one phase that would be covered. Have you, as a consulting engineer, been called in to cover master planning for municipal services?

MR. BREMSER: We are not city planners as such and never have been. We are utility consultants, basically, so we don't do planning as such. We do plan for a particular utility, yes.

FROM THE FLOOR: I am from Toledo, and this is one phase of our master plan, the study of our existing facilities and the planning for the future.

MR. BREMSER: It certainly should be.

FROM THE FLOOR: How often should a master plan be reviewed to keep it up to date? You suggest here the development of a master plan as though you say, "This is the answer, and the procedure is forever more."

MR. BREMSER: Well, generally, I think in the order of a couple of years, maybe four at the most, it certainly should be reviewed pretty carefully, particularly in view of the increase in costs.

You talk about different things and one of them has a lot of labor in it and the other has a lot of capital investment in it, and these things can shift in a few years' time. What looks most economical is no longer that way. This is very true.

We apparently have no more questions. Be back at five minutes until two.

PLANNING PANEL

Messrs. L. W. Bremser, H. T. Merwin, and P. M. Reid

MR. BREMSER: Our next speaker will be Mr. Harmon T. Merwin who is director of the Franklin County Regional Planning Commission here in Columbus. He attended Kent State University and was graduated from the Ohio State University in landscape architecture, served in the air force during the great world war, is a member of the American Society of Landscape Architects, American Institute of Planners, of which he is past president of the Ohio Valley Chapter, past president of the Ohio Planning Conference.

MR. MERWIN: Thank you, Bill.

I had better say it is a pleasure to be here. It really is. It got me out of the office for a while and got me in a situation where I could get in more hot water than if I were back at the office. Being from Columbus, it is, of course, very easy to quote from our newspaper. I dare say, however, that the same sort of quote probably could be made from most other places from which you people come. We are not proud of our particular situation.

As I told Bill earlier, one of my former associates used to delight in opening the car windows as we would drive past this little enterprise. I don't think it smelled any better or worse now than it did then, but, thank heaven, he is not in Columbus any longer and I don't have to contend with that. Keep the windows shut.

I assume my job here today is to give you some idea as to what has been done in the past in this area in the way of planning for solid waste disposal, to bring you up to date on what is presently happening, and I am going to throw in some of my own observations as to where we might go from here, some of the problems that we can foresee, or at least that I can foresee.

We have had the same sort of background that many other places have had. We have had some false starts, attempts have been made to lick this problem or at least start trying to cope with it.

In 1949, the county planning commission at that time called a meeting at which several representatives from the municipalities were present, and they became quite interested in trying to do something about this, however, every time you start getting together with people from various municipalities in a situation like the one we have here or in your areas, there probably will arise some differences of opinion as to who does what, how, when, how much it is going to cost and how do we pay for it.

Not having been with the agency at that time, I can't testify to exactly what happened, but looking back through the minutes it appears to me that there was enough interest that this did spark a beginning back in 1952 when the first sanitary landfill was opened by Franklin County. This continued until 1963 when it was filled up and abandoned. There was an attempt to initiate another landfill by the county but here, again, we got into the problem. Sure we need a landfill, put it over there, not near me. This is the kind of problem we have in many areas, of course.

The Regional Planning Commission hasn't itself been directly involved in this type of problem insofar as trying to solve it. Various members have been interested. We have discussed it from time to time, but we did sponsor and conduct a study of sanitary sewage treatment in 1952, at which time a total system was developed and the system which was developed then is presently being carried out by the city of Columbus.

A new sewage disposal plant is presently under construction and we have great plans for alleviating some of these problems, but this is a different type problem from the problem we are talking about today in that this obviously is not going to take the tremendous branches from various parts of the city where there are trees, or the tin cans, or refuse from other parts of the city or region.

We have had our share of dumps. I happen to live in a part of the metropolitan area that is subject to this sort of thing because there are some old stone quarries around. Sometimes it is rather difficult to see where you are driving. It has been that way, but it isn't like that anymore, of course. There is one that is operated from time to time, but we have a real bad problem, as other places do. There have been sanitary fills used. Several municipalities have had sanitary fills, but I need not tell you -- you have heard this ever since you have been here, that land for this type of purpose and sites for this purpose are very scarce, and these are being filled up. Some excellent landfills have been operated in this county, but where do you go now? You fill up the one that is most convenient to your community and then you have to go on farther.

At the present time, there are about five sanitary landfills in Franklin County or on the periphery which are being used for this area.

There are, as I said, some that are not quite so sanitary. About twenty months ago, the representatives from the municipalities where they were having problems of finding sites, their present landfills having been filled, and not knowing where to go from there, got together and discussed these problems with the board of county commissioners, county sanitary engineer, and I was in one of the earlier meetings at which time these problems were discussed. It was generally concluded that something had to be done about this, and it was really a serious problem.

As you know from attempts to build reservoirs, it takes some time from the time you start thinking about the problem until you have a facility that is actually producing water for you. This is no different. It does take time. We need to have the background in the way of statistics and proposals.

Back last May the county commissioners entered into a contract with a consultant to conduct a study for the solution of this type of problem. This was a cooperative effort between the board of county commissioners and a majority of the municipalities in the county. In fact, the agreement provides that approximately 98.5 per cent of the population of 1960 is cooperating in this study through their representative communities and the county. This is quite good, in my opinion, to have that many. The ones who are not cooperating are for the most part small communities and some are isolated at the present time and may not even realize that they have the problem.

This was to carry out a study which would ultimately provide a solution. At the present time -- and this has been going on for over a year, about a year and a half -- we have a comprehensive planning program going on that we call The Blue Plan. I won't tell you why it is called The Blue Plan, but that is what we call it. In it there is a provision for this type of problem. However, as far as the actual solution would be concerned, it is well down the list, timewise. At the present time, we are conducting studies on economics and population, inventories on transportation, land uses, and other normal studies that you go through in developing a comprehensive plan for the region. This is the type program that was alluded to earlier where the Federal Government passed the Highway Act of 1962 stating any urban area with a 50,000 population had to have an area planning process or you didn't get funds after 1965. This is a part of this program.

People came to our office to ask and we are only a part of this comprehensive program. We are a contracting agency for a portion of it, but there are many other agencies, the city of Columbus, other municipalities, private organizations and many others who are cooperating in carrying this out, helping in the way of staff, advisory committees, et etera.

They wanted to know what was in this program for this type of study. Well, as far as the timing was concerned, this was not adequate because they felt it was unnecessary to get this going, get some ideas, and get some solutions underway before this program would be completed or far enough along to get something done.

As a background, that is where we are as far as the total comprehensive planning effort is concerned in this county, in this region. This region is Franklin County and the municipalities within it. We have a separate study which is under contract with the county commissioners for this solid waste disposal study.

I will go over the various elements that are involved in the study and indicate the types of things that are being done at the present time and then later indicate how I feel that this type of study needs to be coordinated with the comprehensive program, which is under way.

Determine the source and quantity of all refuse produced in Franklin County, Ohio. This will include residential, commercial, and industrial garbage, trash, brush, clippings, and non-burnables; industrial solid wastes; and refuse from governmental agencies, schools, parks, municipalities, state institutions, federal air bases, et cetera.

Determine seasonal fluctuations in refuse quantity and, refuse composition.

Investigate present collection, geographical load sources and disposal methods and vehicles.

Estimate county population growth for the next twenty years. Predict the twenty-year growth pattern for each refuse producing load center, including the townships, villages, cities, and collection districts to determine the probable shift in load densities.

Estimate the future refuse production of each load center based on population growth trends.

Tabulate the present and future average daily refuse tonnage produced by each load center.

Survey Franklin County topography maps and investigate possible landfill sites including ravines or other natural basins; abandoned or worked-out quarries, gravel pits, or other mining operations, for an interim landfill program.

Allocate the load centers to be served by each suitable landfill on the basis of economical haul.

Determine the probable interim life of each landfill site based on the refuse load and growth of the centers served.

Estimate the capital investment required and the owning and operating cost of a county operated interim landfill program.

Determine the number, size, and location of disposal plants for a county operated solid waste disposal program. Size of disposal plants to be based on present and future refuse loading. Number of disposal plants and location to be based on economical haul from properly allocated refuse load centers and on-site feasibility and availability.

Estimate the capital investment for disposal plants required and the owning and operating cost of this county operated disposal program.

Determine the size and location of centrally located disposal plant or plants operated in combination with transfer stations and transfer trailer trucks.

Estimate the capital investment required and the owning and operating cost of this county operated disposal plant or plants and transfer station program.

Prepare preliminary drawings and outline specifications for the proposed disposal plants showing the general arrangement of all disposal equipment and facilities including transfer stations.

Prepare and submit architectural renderings of each plant for review and approval.

Prepare and submit an engineering report covering all stages of this study complete with the engineer's findings and recommendations for developing a long-range plan to economically, safely, and satisfactorily dispose of the solid wastes produced in Franklin County, Ohio.

That is the phase one to be completed in six months.

Phase two will require a maximum of twelve months, but to be completed earlier than that if possible. Only a couple of items from this are important.

Prepare specifications and general layout drawings on long-term delivery items such as incinerator, stoker, et cetera, and assist the Board in soliciting bids immediately to reduce total installation time.

Prepare complete and detailed working drawings and specifications for disposal system facilities.

The third phase, to take an estimated time of twenty-one months after start of construction, would be to provide construction supervision in getting the program underway.

What will result from this study? What can we expect in the future? Well, I am firmly convinced we can expect a metropolitan system. As I have indicated before, there were attempts to develop a metropolitan system and this didn't come about, but I think this situation is so critical now the various public officials, various persons in responsible positions, are going to have to cooperate and work together in such a fashion that there will be a metropolitan system, and as evidenced by the number of people and the number of communities involved -- incidentally, this includes twenty of the twenty-six municipalities within Franklin County, plus the county itself, so percentage-wise this is a good representation of the plans for cooperation presently going on.

The state law was revised this year to make possible certain things that were not possible in the past. I won't go into this now because John Coleman, as I understand it, will be discussing the state law tomorrow and I don't want to steal his thunder.

Basically, what the law provides now is for the county to operate a system which includes municipalities. Before, this wasn't possible. Now it is possible to have a metropolitan or county-wide system.

The reason I used the word "metropolitan" obviously is that a great portion of Franklin County is urbanized and we think of it as a metropolitan area rather than a region which is normally considered a larger area.

I believe that the law is now sufficiently flexible or provides sufficient flexibility to get the job done in some fashion. I do think, however, that certain parts of the state, possibly in the Cleveland area and maybe in other areas of the state that in the future there is a shortcoming in the law in that this is restricted to one county, as I read the law. In other words, you can't set up a district that includes more than one county. In the case of northeastern Ohio, a much more densely populated area, I think there might be need to include more than one county. In these transportation studies, there is a seven-county study going on in the Cleveland area, another in the Cincinnati area, the Ohio-Kentucky-Indiana study including parts of the three states, and I think six or seven counties are involved in the three states.

Toledo includes parts of Michigan and Ohio in its transportation study. I think that where you have a metropolitan area or a regional area that is generally urban in nature, this type of problem along with many others are, by necessity, going to have to be handled on a broader basis. We cannot handle these problems on an individual municipality basis. I just don't see how it is possible because it is not economical. The sites aren't available, and it just doesn't make any sense. These are types of services that need to be handled on a broader basis.

The reasons for this, of course, are due to the overall population expansion. For instance, in 1965, January 1, we had about 800,000 people in Franklin County. It is estimated -- and I say this is an estimate now, not a projection because the population study isn't quite complete yet -- but I would say somewhere between 1.3 and 1.4 million people are anticipated by 1985, a 20-year period. This depends on many things, as we all know, and maybe nobody else is going to come to Franklin County, but I doubt it. If there is, we can determine this. It is an estimate. This is a lot of people.

You know the changes that have been taking place in refuse, it has generally gone upward and these are problems that have to be solved along with transportation problems, schools, and so forth.

Will the system be compatible with other planning in Franklin County? As I have indicated earlier, we have the comprehensive planning program now underway in the county and this includes the things I mentioned before, plus many others which I didn't mention but which I will mention at this point, which is a study of the water and water-related facilities for this county and that are needed for this county, in this urban area.

This is going into the matter of water supply, water pollution, low flow augmentation, recreation, and also the disposal of the sanitary wastes through the sewage disposal system and their inter-relationships.

Very obviously, if we have landfills -- and this is a problem of contamination of ground water in the water facilities' study -- there should be an attempt to use some of the underground water supply which we think we have, from all indications, there is some rather large supply, we hope, in the southeastern part of the county. If we should start going in this direction when we don't want to create some problems by other activities, it must be considered. That is going to damage that. These have to be considered together, in a comprehensive approach.

Likewise, as we plan for transportation facilities or other community facilities or schools and other types of uses, we want to try to make sure, if possible, that these work together rather than in opposition to each other.

This is a monumental task, but this is a summary of the attempts that are being made in various parts of the country now, and you can't get all types of studies in one office, or with one agency, and as far as I am concerned, I am not interested in this all being with the Franklin County Regional Planning Commission, not interested at all, but what I am interested in is that there is an adequate communication between the various studies that may be going on in any urban area that each knows what the other is doing so that they can see how the one affects the other.

To give an example of an activity that we have had going on for some time, we have what we call a subdivision review committee with various members of the State Health Department sitting on it. We bring representatives from the sanitary engineer, county engineer, municipalities where it is within three miles of the municipality involved, our office, and the county health department and various other agencies that have some accrual responsibility. We sit down together and discuss the plans and proposals at one time so that you can see how maybe the health department's problems affect the sanitary engineering problems, or the county engineering problems, or others. We have resolved, I believe, some of the problems that we have found in the past by merely sitting down together at one time and looking at the situation so that you can see how the one decision affects the decision of somebody else.

I think I have gone way over my time, so I will run through this and just hit a couple more points here.

Basically, much of the discussion that you have been having so far deals with engineers and the type of work that engineers are formally involved in. However, you are also working in areas of land use, I mean the decisions you make are related to land use like planners are concerned with, recommendations on zoning, recommendations on future industrial areas, recommendations on residential areas, commercial areas, parks, schools, and so on, where these are to be located, so that you will have a team effort.

As you mentioned earlier, the various types of engineering are to be involved in this, plus the chemists. I think we have to have this comprehensive approach to manpower as well as to facilities in order to do an adequate job.

One of the things that I think we may need in the future is what we might call industrial salvage department. Instead of having the old beat-up trucks and cars and so on scattered over the countryside, we should put them into what we could call industrial parks so we could have several companies located in one place, bringing them together and relating them to other types of uses.

Certainly as far as incineration and landfill, if there is to be a combined operation of this sort, or with composting, I think there has to be very careful consideration given to how these uses or activities are going to relate to demand use, to the transportation system, to the distance as far as hauling the product, or the residue, and that in some cases we may have to forego some economy because of health conditions or other conditions.

I think it is about time that we started looking into conservation a little bit. I am not taking sides, now, with the incinerator proponents, the landfill proponents, or the compost proponents, but what I am alluding to is that we have to consider all types of means for disposing of our refuse, that the time is going to come, I am afraid, that we are going to wish that we had some of the tin cans that we are trying to get rid of, that we do build up our land by composting, because you can't always be taking something out without putting something back. I think this is a law of nature, so what I am saying is that I think we are probably going to have to take a look at all these different types and have a comprehensive approach to the way we handle these different problems, and related to all other types of land uses and transportation and so forth that I have alluded to earlier.

Regardless of how these studies are done, who does them, there has to be sufficient communication between the different agencies, departments, and the people that we are going to come up with a product and a procedure and a plan that is going to be acceptable to all.

MR. BREMSER: We are now going to hear from Mr. Paul Reid, Executive Director of the Detroit Metropolitan Area Regional Planning Commission.

Mr. Reid received his Bachelor of Arts Degree from DePaul University in Indiana, and his Bachelor of Divinity Degree from Union Seminary in New York. He also attended London School of Economics on a fellowship and did graduate work at Columbia University.

After completing his academic training, he became engaged in adult education work in New York and Chicago, five years, and historical work in Illinois, two years.

During World War II, like so many of us, he was also in the service. From 1946 to 1948 he worked with the Michigan State Planning Commission and the Detroit City Planning Commission.

In 1948, he became associated with the Detroit Area Regional Planning Commission as a planning analyst. Since July of 1956, he has been the Executive Director of that planning commission.

MR. REID: What Mr. Merwin said about getting into hot water, I thought coming all the way from Detroit, I didn't have that trouble. When he said hot water, though, he reminded me of a story. It seems this young lady was playing golf. She was built along the proportions that a curve is the sweetest distance between two points. This day she went out on the golf course to take a lesson from the pro. She was wearing a golf skirt with the zipper in the rear and a sweater with a zipper. As the golf pro took her out to the first tee, he put his arm around her to show her how to hold the club, but, unfortunately, the zipper on her skirt and the zipper on his pants got caught together. It was a very embarrassing situation. The more they tried to extricate themselves from the difficulty, the tighter the doggone things got stuck. The only thing left to do was to sort of lock step to the pro room to get out of sight and then get this undone. Just as they got to the door, a big Saint Bernard dog came along and threw a big bucket of water on them.

First, as a planner, I would like to clarify the use of terms a little bit. Traditionally in physical planning, we have used the term master plan to describe the many elements or components of a plan that go up for guidance for the physical development of a city, county, or region.

In recent years, we have been using the term "comprehensive plan," and now there is even a new term, "development plan."

When your previous speaker, the main speaker, Mr. Bremser, spoke of master planning for waste disposal, he was in my judgment talking of a master plan for one of the components of the total community plan, namely, waste disposal.

There must be master plans for sewer, for water, for highway, and all the other municipal functions, and Mr. Merwin told you all these together for the comprehensive plan for unity of government, be it a city, a county, or a region.

I agree very heartily that there needs to be a master plan for each of these components, facilities, or functions that together make up the physical structure within which an urban area develops. The kind of things that Mr. Bremser was laying out before you seemed to me exceedingly vital. I would like to touch on some of them. Certainly we need facts. The person who says, "Don't bother me with the facts, I have made up my mind," not only convinces us of his bigotry but also his ignorance, and in service to the public, whether as a governmental official or consulting firm, we have no place for bigotry of this kind. We need to know the facts and to analyze the facts.

We need to know about the quality, character, and location of the origin of solid wastes in our community. We need to know the collection routes and the disposal routes of the truck or whatever vehicles are utilized, as they make an impact on the transportation system of the area.

We need to know the character of the current population. We have a hunch that some areas produce much more solid waste than others, either because of high economic level or low economic level, and these areas where we get an unusual contribution or a low contribution of solid waste for public disposal needs to be known.

We need to know the character of commerce or manufacturing, what kind of solid waste they produce, and where they are located in the city, county, or region.

One other factor, it seems to me, is exceedingly important also, to know in collecting facts the current attitudes of public officials and citizens in regard to waste disposal as a civic problem and as a civic necessity.

When we look to the future, we have to expand this a great deal.

Harmon Merwin spoke of making a topographical survey to find what areas in Franklin County might be available for use as sanitary landfill sites. We need to know the possible areas where incinerators could be constructed. These obviously need to be located in relationship to the source of production of various varieties of solid waste. We need, on the other hand, to know the location and expected or planned areas for future residential, industrial, and commercial areas for these are the areas that will be producing the kind of wastes that have to be disposed of.

I suspect we have to look somewhat into a crystal ball to see what changes in the character of solid waste are likely to occur over the next twenty years. Certainly, there are bound to be some. We have seen some over the past twenty years.

Again, plotting of the future travel routes of collection trucks or trucks going from a central place to a disposal area, be it sanitary landfill or incinerator, this, too, needs to be plotted out in planning.

Then, I would add two other points. We need to consider the reuse of sanitary landfill areas for recreation, for open space, for things of that character that will not leave these areas forever a waste, but utilize them as a benefit for the community as a whole.

Perhaps I should have said this first, but I think the desires and attitudes of people ought to enter into the kind of master plan for solid waste disposal that has developed.

In the process of developing this component of the comprehensive plan for a community -- and I will have a lot more to say about this tomorrow, it seems vital to me that representatives of all concerned interests ought to be involved in developing a study, in developing a recommendation and the plans for the future, not just the particular section of the public officials represented by engineering, sanitarians, and physical planners, but other agencies of government like recreation as well. Along with them, civic groups, neighborhood organizations and the public at large ought, in my judgment, to have a hand in the whole process from start to finish. It seems to me only that kind of involvement provides the best insurance for the effectuation of plans that are thus cooperatively developed.

One of the dangers that we have discovered in the Detroit region to achievement of a collective plan is the occurrence all too frequently of crises in one of our 178 communities where their landfill site has run out, where the capacity of their incinerator has been reached and over-reached, and where something has to be done right away. In approaching this problem of today, tomorrow, and future planning and program for solid waste disposal, I think we have to have enough flexibility to somehow adjust to these emergency situations.

In the Detroit area, we had one city of over 100,000 population that was faced with less than a week's additional disposal space left in their sanitary landfill system which was in another county.

This can really create crises, and planning by crisis is always, it seems to me, short-sighted and leads to greater quantities of collective hot water later.

I think that is about all I have to say on this occasion. I don't want to steal my own thunder tomorrow.

MR. BREMSER: Thank you, Mr. Reid.

Does anyone have any questions at this time?

FROM THE FLOOR: In both these Detroit and Franklin County studies, are the cooperative agreements irrevocable, or are they revocable by the government bodies that are participating?

MR. MERWIN: In Franklin County, the agreement is only at the present time to do a study.

MR. REID: In the Detroit region, we have done the study. We are in the process of implementing the plan and I hope to high heaven when it is implemented, it will be irrevocable, but under Michigan law, I will be damned if I see how it can be done.

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The Master Refuse Plan, a hypothetical problem, was then discussed.

The problem and discussion are contained in Appendix I.

THURSDAY MORNING SESSION

IMPLEMENTATION OF A PROGRAM

The Thursday morning session convened at 8:30 a.m., Mr. Crane presiding.

MR. CRANE: It is a pleasure this morning to have Paul Reid back with us to tell us about the current status of implementation, particularly of the program they have developed in the Detroit area.

MR. REID: This is awful early in the morning. I don't know whether you got the sleep out of your eyes or had enough breakfast to get awake, but I am just about there.

Somebody was telling me the other day about a family that got fed up with big city life and decided to move to the suburbs, one of the suburbs in the Columbus area. I think it was Grove City. The family had a little girl about six years old and the last night in the old house, the little girl knelt down to say her prayers and said, "Goodbye, God, we are going to Grove City."

I think this is the attitude sometimes of central city dwellers in thinking that they are escaping God and conscience and the problems of the metropolitan area.

On the other hand, I heard of another young couple who moved out to Bexley, and in this rather plush suburb one Sunday afternoon, the young husband was out mowing the lawn. It was rather warm and he peeled off his shirt. He was still too warm, so he peeled off his undershirt, and was mowing the lawn out there in a bare back. One of the dowagers who lived across the street looked out and saw this sight and was horrified and called the village police. A little later, a patrol car came up and the patrolman walked up to this guy and said, "What are you doing here?"

The man said, "Mowing the lawn."

"Do you think that is a proper attire to wear?"

"Well," he said, "it is cool this way. I sweat and when the wind blows across my flesh, it cools me off."

The policeman said, "But what would the people think if your wife got out and mowed the lawn that way, what would they think?"

The man said, "Oh my God, they would think I married her for her money."

Now, if you are not awake, you ought to be.

CURRENT STATUS OF IMPLEMENTATION OF SOLID WASTES PLAN
A Metropolitan Case Study

By: Paul M. Reid, Executive Director
Detroit Metropolitan Area
Regional Planning Commission

Introduction

This presentation is primarily a case study in the inter-community aspects of implementing a solid waste disposal program. Some of its content will be of value to single, isolated city situations, but the focus is on the inter-governmental problem of our expanding urban areas. In the Detroit area, we could take no other approach. We were faced with the fact that 82 of the 178 local units of government (cities, villages and townships) that had collection systems were disposing of their refuse outside their borders, within the territory of another unit of government. Perhaps there is an ironic rationale to such a situation. We import into our communities, largely from far-distant places, much of the material that creates our refuse: food, tin cans, glass bottles and jars, paper boxes and cartons, and so on. So each community in an urban complex seeks to export the refuse from these items to another nearby community, with a handy land fill or dump. You might call this process one of the quirks of modern urbanization.

In most of our urban areas - large and small - the collection and disposal of solid waste is on a make-shift basis. Expediency tempers the confusion but leads to ultimate chaos. Public health and community sanitation hang by a slender thread.

I. Necessity and Strategy for Developing and Implementing a Solid Waste Disposal Plan.

Both the character and the quantity of solid waste has been changing over recent years. In addition to tin cans, we now have frozen food cartons and disposable bottles. The power mower has increased the frequency of grass cutting. And the new postal laws have multiplied the pieces of junk mail left at our doors almost every day. In the Detroit region, we found that the average family accumulated about 1-1/2 tons of garbage and rubbish per year. And this was exclusive of the demolition materials resulting from residential re-development and commercial rebuilding.

In our region - and I presume the same is true in most other metropolitan areas - the obtaining of land fill sites has become more and more difficult. Successive rings of urbanization - residential, commercial and industrial - around the central city have pushed old-fashioned dumps out farther and farther. At the same time, the residents of less densely settled areas are objecting to and banning dumps. It is harder and harder to obtain sufficient sanitary land fill sites. The mad scramble of the core city and the older, close-in suburbs for adequate disposal sites has become an anarchical race.

Increasing tensions between the disposing unit of government and the receiving unit have resulted in frayed tempers, desperate and shifty methods, antagonistic attitudes and even lawsuits. The central city bears the brunt of these feelings, because it has the most solid waste to dispose of and because its need cannot be served by a single disposal site. Much of the motive power that enacted our recent sanitary land fill law in Michigan came from suburban legislators, who joined shoulder to shoulder with the public health people.

31 out of our 178 local units of government (cities, villages and townships) had no collection system (all but one were townships).
54 local units were served by private collectors.
49 local units had government contracts with private collectors.
44 units were serviced by publicly operated collection systems.

The strategy for developing and implementing a sound plan for the collection and disposal of solid waste must be formulated on the basis of and in the face of this typical kind of an inter-community situation. In our urban areas, the significant feature of the solid waste problem is that it is inter-governmental. Hence, its resolution must be at the inter-governmental level. A common recognition of the extent and mutuality of the problem among officials of the beleagured units of government is a primary step in setting up the apparatus for attacking the problem.

Public awareness and understanding are also essential at the outset if a successful effort to dispose of solid waste properly is to be developed and effectuated. Some citizens always seem to regard the warnings of public officials as a cry of "Wolf, Wolf!" But in nearly every community there are enough alert citizens to join in an organized program to overcome the solid waste disposal problem.

Our experience in developing a plan and program in the Detroit region illustrates the major points I want to make here.

Four years ago, an ad hoc committee of supervisors from our 5 member counties recommended that our regional planning agency put emphasis on facility planning. They placed Garbage and Rubbish

Disposal high on their list of priorities. The Supervisors Inter-County Committee - which is made up of representatives of the 6 SE Michigan counties - not only supported this recommendation but offered to take a major part in the implementing of a refuse disposal plan. This background is important, for it insured at the outset that our Regional Planning Commission had governmental support for such a project, and that backing was on an inter-county basis!

Setting up the Study

The Staff then proceeded to develop a project outline. We anticipated that the sanitary disposal of refuse would require large areas of land, and that such land use would have to be related to other land uses, now on the ground or anticipated. Further, we saw the opportunity and potential for the re-use of sanitary land fill areas as local, county and regional park facilities.

Our project application to the Housing and Home Finance Agency of the federal government for matching funds was questioned by officials at first as a "housekeeping" study. They were finally convinced of its value, both from the relationship of land uses and the re-use of sanitary land fill areas for recreation. In this connection, let me say that the environmental health policy paper which I presented last January to a national governmental relations conference of the American Institute of Planners made this policy recommendation: That the Institute seek amendments to housing legislation, "to permit and encourage the Housing and Home Finance Agency to join with the Public Health Service of the Health, Education and Welfare Department (under arrangements similar to HHFA and Bureau of Public Roads cooperation in transportation) in approving and supporting environmental health studies and planning," especially in relation to metropolitan regions.

The project costs were estimated at $69,000, of which the HHFA agreed to provide 2/3, with the remaining 1/3 from our agency budget. Actually, total costs of the project ran to $71,860, of which our agency provided $26,000, somewhat over one third. The study was to cover 5 counties, with a population of over 4 million people and an area of 2,800 sq. miles.

Our agency employed a professional engineer to direct the study and gave him the post of Deputy Director for Facility Planning. We recognized that as planners we had neither the skills nor experience to handle the technical engineering aspects of the study. At the very outset, we set up a large Advisory Committee, composed of 25 staff representatives of health agencies, road commissions, county planning commissions, departments of public works, university people and private engineers. This has been the project procedure of our agency since it was established in 1948. We have found that such advisory committees are invaluable in technical studies and of great help in implementing plans and projects.

The purposes of the project, as defined by the agency and concurred in by the Advisory Committee were 4-fold:

1) To present a picture of the current practices of collection of refuse, as it relates to disposal.
2) To examine the various methods of disposal.
3) To formulate a plan for future disposal which would insure the future welfare of the region, with health as the first consideration and economy as a secondary goal, and
4) To recommend possible future uses of land, where the disposal process was completed.

From previous experience, we figured that much of the needed information could be obtained from mailed questionnaires. Hence, with the help of the State Health Department (and a previous survey by Michigan Municipal League) we designed a 13-page questionnaire as the means of assembling the essential data on collection, disposal, governmental arrangements, and the like. Over 75% of the local units of government - cities, villages and townships - replied, in due time. Telephone calls and personal visits to the remaining communities gave us complete coverage.

In addition to this method of gathering data, members of our Staff made a number of surveys in the field - of existing incinerators, land fill operations, potential land fill areas, etc. They not only looked and evaluated, they took pictures too!

After this intensive survey in the Detroit area and an evaluation of the composting process, our study reached the conclusion that two basic tested methods of solid waste disposal were feasible: (1) Incineration in large-scale incinerators, with disposal of the residue ash in sanitary landfills, and (2) Sanitary land fills of raw refuse.

The TWO Plans

On the basis of these conclusions, two plans were developed for the disposal of solid waste in the 5-county Region. Presented as alternatives to the governmental agencies involved, these two plans differ largely by emphasis on the use of incineration and the use of sanitary land fills, rather than by opposing methods.

In 1960, the total population of the 5-county area under study was 4,035,920. Our Population Advisory Committee (a working group that has been making annual population estimates and periodic projections for 12 years now) projected the 1970 population to 4,762,000, a gain of 727,000 (18%). For 1980, an additional ten-year gain of 1,034,000 (21%) to 5,796,000 was projected.

Plan I, in the core urban area, recognizes the effectiveness of three of the current district operations and leaves them on their own.

The 7 existing incinerators in the core area are to be maintained and utilized to the full extent possible. The total 5-county area is divided into operating districts. A series of transfer and loading stations in the urbanized area is established on this district basis, for assembly of refuse. These collections will then be transported in closed vans on railroad flat cars to a major sanitary land fill area at the north of the region. Here, sanitary land fill operations will be carried on, with modern equipment, with all the requirements carefully fulfilled.

In the districts outside the urbanized area, a system of local sanitary land fill operations is established, utilizing some existing sites as well as new ones, and under established standards.

The Advisory Committee developed recommended minimum standards for sanitary land fill operations and for indoor refuse burning equipment for domestic, commercial and industrial incinerators. These were all published as an integral and important part of the report.

Plan II. This variation, adds 7 incinerators and places greater emphasis on this refuse disposal process in the urbanized areas. Since more incinerator ash will thus be produced, the closed van and railroad flat car transportation from transfer and loading stations are still utilized. The outlying districts, with their separate local sanitary land fill operations, are continued.

When these two plans were developed, it was deemed essential that further data regarding costs of establishment and operation were required. Hence we employed the consulting engineering firm of Consoer, Townsend and Associates in Michigan to develop basic data on costs and financing of the two plans.

In line with our concern for the re-use of sanitary land fill areas, we also employed James C. Scott Associates, landscape architects, to develop a series of sketches of just how both large and small sanitary land fill areas could be developed into a variety of parks for different types of outdoor recreation.

Implementing the Plan

As soon as our report was off the press, we made a full-dress presentation to the Supervisors Inter-County Committee. On the basis of this report, that body at once urged its member counties to examine the report carefully and then begin to develop the necessary steps of implementation. In time, all 5 counties involved had special committees of their Boards of Supervisors at work on this matter. One county (Monroe, just north of Toledo) approved the report of its Public Works Committee that had studied and accepted the refuse disposal plan for the County. Three of the townships of this county have developed public works projects, awaiting approval and financing, for implementing that part of the regional plan that applies to their jurisdictions. In Wayne County, the Sewage Disposal and Water Supply Committee of the Board of Supervisors approved the principle of metropolitan approach in the plan and asked for methods of governmental action to set up a metropolitan agency. In the other three counties, study is continuing.

The Metropolitan Fund, Incorporated, our voluntary regional research agency, was deeply concerned with implementing a regional refuse disposal plan, and underwrote $12,000 for the production of a series of scale models of the plan, for use in informing citizens and local officials as to its need and workings. These models include an incinerator, a transfer and loading station, and a sanitary land fill operation, with a huge contour map of the region in the background of the display. The models have already been displayed in four of the 5 counties and at a local chapter meeting of the American Public Works Association and at the National League of Cities Conference in Detroit. They will be utilized thru-out the 5-county area, at county seats and in the various cities and townships.

I had hoped to bring with me copies of the brochure, explaining the waste disposal models, which will be distributed when they are displayed. Unfortunately, they are on the press. As a further step in implementation, the Metropolitan Fund - at the request of the Supervisors Inter-County Committee - is now undertaking a legal study of just how to set up a regional solid waste disposal authority. Under our new constitution, the establishment of such metropolitan service authorities is permitted, but enabling legislation by the state lawmakers is required for this end.

Our legislature this year, the first one under the new constitution and re-districting, passed a law to license and regulate garbage and refuse disposal. Several of the members of the Advisory Committee that assisted in our study are on the state committee set up by the State Health Department to write the standards and regulations for sanitary land fills.

As one result of all the work I have described in the Detroit region, we now have three governments jockeying for position to be the agency to head up or actually constitute the regional solid waste disposal body. In July, the Detroit Common Council directed the City Public Works Department to talk to the suburban communities about an area-wide system for rubbish and garbage collection and disposal. Fred Cheek of our Staff has been asked by the DPW to assist in preparing the report for the Council at its October 13th meeting. The Wayne County Road Commission is making an effort to head up a solid waste disposal operation for the Detroit Region. And the county of Oakland, north of Detroit (which contains the site of the large gravel pit area which we proposed as the major sanitary land fill site), through its chairman and the head of its county Department of Public Works, is also making a bid to be the organizing means for a region-wide solid waste disposal agency. Up to four years ago, the best that could be done in the region was the organization of a dozen adjacent communities into a sanitary authority for solid waste disposal. Now, an inter-county agency, comprehending from 150 to 175 local units of government seems to be in the active process of gestation.

SUMMARY

In summarizing, I am sure I will be guilty of universalizing on the basis of our experience in the Detroit region. Perhaps, I will even pontificate!

1) The action program for the establishment of an inter-community or inter-county solid waste disposal operation must be an integral part of the study and process which develops the plans for the operation. The desired action steps can come only out of the cumulative concern and the impetus generated from the process of making the study and formulating the plan.

If we were to do the job over from scratch in the Detroit Region, I would strongly recommend in addition to the inter-governmental and inter-agency approach and the use of a competent technical Advisory Committee, that we also set up two other very important corollary bodies. One would be a Policy Body of elected officials from the region, under which the study and program would be developed. The other would be a Citizens' Advisory Committee, both for its value in making helpful and pertinent (and even impertinent) suggestions and for its utility as a means of disseminating information and obtaining understanding through a wider area of the public. I would also recommend urgently that staff members of recreational agencies - local, county and regional - be added to the Technical Advisory Committee. They could perform a real service in promoting the idea and developing the plans for the re-use of sanitary land fills as park and recreation areas.

2) Success in establishing a region-wide solid waste disposal operation depends almost as much on the informing and education of the public as to its need and feasibility as it does on its internal technical soundness. A program of this scale, involving a regional authority or binding intergovernmental arrangements, will cost money. The tax-paying citizen wants to know both why it is needed and how much it will cost.

We used the excellent film on sanitary land fill produced by Los Angeles County during the course of our study. But we did not use it widely enough. And we should have gotten out other pieces of informational and educational material during the course of the study. Now in the implementing stage, films and pamphlets and talks are needed even more urgently.

3) The legal aspects of setting up a regional solid waste disposal operation should form an integral part of the basic study and constitute a vital part of its recommendations. We had enough sense in Detroit to employ competent consulting help to detail the costs of the program in advance. We should have been as foresighted in developing the legal side.

4) Formulating a sound and feasible plan and program involves a number of agencies of government - public works departments, planning commissions and staffs, health departments, recreational agencies - and their professional people: sanitary and public works engineers, planners, recreation specialists, and so on. An all-out effort should be undertaken to involve all these agencies early in the study. Each has a part to play. Together, the agencies and their professional staffs provide a strategic means of keeping governmental boards and the public informed and getting the commitment of civic, social and neighborhood groups to the recommended operational program and its parent agency.

5) Prepare at the outset for attempts to exploit the needs of the solid waste disposal situation on the part of some private enterprisers. We have had them in the Detroit Region. They used our study to approach some local community where waste disposal had reached a critical stage and offer to build them an incinerator with greater-than-needed capacity and sell its services to the adjoining communities. Or they offered a "monster" of a machine that would drive along the street and grind up the garbage and refuse - from sardine cans and refrigerators to 10-inch trees - and take it away in small bundles. They even had the guts to ask our agency to promote this machine! Or they may offer to build an untried and uneconomic composting plant for one community, and get customers from others to help pay for it. Unfortunately, the pressure of need for some way out of the solid waste disposal situation has multiplied the gullibility of otherwise cautious hard-minded engineers and city officials.

6) Finally, I am keenly aware of the fact that implementing a solid waste plan and program on an inter-governmental basis is professionally a task and responsibility for the political scientist. We planners recognize that we are not experts in political science, that this is not our field of competence. Most engineers I know in public works and sanitation departments of government have the same feeling. But the major fact is that we are concerned professionals. The problems we face cannot be solved solely by planning or by engineering. The academic political scientists have not been of much help in the situation. The practical political scientists - the public officials and administrators in city and county government - are much closer to the situation, but in some cases have had less experience at the inter-governmental level than we have. So what do we do? We can't turn our backs on the implications and outreach of our professions. We simply have to keep working on our jobs, wherever they lead us, whatever knocks and headaches they bring - working with other government officials and the public and seeking orderly and healthful communities in better-serviced and better-planned metropolitan areas. We have put our hands to the plow, willingly. We can't turn back!

MR. CRANE: Thank you, Mr. Reid.

I am sure we have some questions for Mr. Reid.

FROM THE FLOOR: Let me understand this sequence. You had a regional planning organization set up first?

MR. REID: Yes.

FROM THE FLOOR: With this organization, you had certain funds which were used to start your initial studies and so forth, is that right?

MR. REID: Yes.

FROM THE FLOOR: All right, that is what I needed clarification about.

MR. REID: Our regional commission has been in operation since 1948. We had the additional advantage of this supervisors' accounting committee, made up of six supervisors from each of the counties who are the best substitute for a legislative body that the planning commission had. A county commission has a planning board and a city council -- a city has a city council. The supervised inter-county committees, we have been their advisor since they were set up ten years ago and they have helped us a great deal in setting up and initiating studies. We had those two assets to start with.

FROM THE FLOOR: You mentioned the use of a 13-page questionnaire as part of your survey. As a governmental official, I sometimes get these 13-page deals and they look like junk mail right on the face of it. Tell me, what sort of a response did you get to this and to whom did these go? Obviously they didn't go to John Q. Public.

MR. REID: They went to the officials responsible for the collection and the disposal of garbage. We had 178 separate governments in the area and 13 of them had no system. We had a place to be filled out if they had no system.

Of the others, we got a 75 per cent response by mail. We made telephone calls and got a lot more by mail and finally we had to go out in the field in not more than eight cases and get the data.

We had fine cooperation in the Detroit area.

FROM THE FLOOR: Did your plan include collection of refuse?

MR. REID: No, we did not provide for a uniform collection system. This could very well be written into the plan, but our plan is united from the point of the assembly of garbage and transportation to a transfer station or the central dump.

Some of our communities have excellent collection systems, and some hang on by a thread with private collectors and so on. We would hope to see a much more efficient, uniform, and sanitary system of collection through these forms.

FROM THE FLOOR: Did you have any -- I am really interested -- how do you discourage these private operators that offer composting plants, et cetera? We run into this problem all the time and these fellows are always going to put up their own money, you know, make everything real easy for the public, the poor overworked public officials, and it is very difficult sometimes to match them with a program that you know is actually developed properly and does have all the money in it, that is not going to double in cost after three or four years. I was curious if you have any good ideas.

MR. REID: We have no active anti-selling program on these, but we do say to the village officials and township officials, "Have you seen our report? Do you know its recommendation? Do you know your county is considering this as a means for an inter-county situation?"

One case I know where a township board was just on the point of signing a contract with an incinerator company, their township supervisor got hold of our report which he should have found on his desk a year and a half ago and came up with a quite different recommendation to the board.

It is education, information, persuasion, and, as I say, we have no active anti-selling program on this.

FROM THE FLOOR: My question has three parts. The first is: Do you have a form of intergovernmental agreement worked out?

MR. REID: No, to the first one.

FROM THE FLOOR: Do you contemplate that if you were doing it over you would introduce such a cooperation phase at an earlier stage? I guess that takes care of it.

MR. REID: As I said in my report, the metropolitan fund is doing a legal study of how we get the machinery to do it. The constitution says there may be metropolitan service authorities, but it takes implementing action of the state legislature to put it in operation and there are studies under way of what kind of legislation is needed to be adopted. Under existing law, they can make certain compacts together.

FROM THE FLOOR: You said the ultimate use of landfills would be made in the form of recreation, parks, and so forth. Do they consider the use of this land for any other purpose such as industrial or anything of that manner?

MR. REID: No, neither industrial or residential. The settling qualities of the fill upset that idea.

We have some unplanned refuse refilled areas within the urban area now on which homes are built and which are beginning to sag this way and that. We are also very aware of the problem that gas is generated by even sanitary landfills that may seep up through the ground and make buildings unpleasant, so we have not recommended structures beyond toilets and open shelters for a park ground or something like that.

FROM THE FLOOR: This problem, I think we all face. This type of report is what use can be made of the land, the park land, and I wonder, nowhere along the way have we done much about this particular item. What was your reply to the various counties and agencies with regard to this? If they could sell it commercially for industrial use, there might be something in that.

MR. REID: I am not an engineer, but our engineer on the staff says this isn't feasible and shouldn't be done. I take his word for it, even if you sink piling down below where the sanitary landfill operation started, you still have the possibility of the gases, including methane.

FROM THE FLOOR: What method of financing do you contemplate in the construction of the facilities?

MR. REID: We would anticipate that revenue bonds could be utilized in Michigan for this sort of enterprise.

I should have added that we have five different sketches in our report of small and large landfill areas redesigned for recreation areas of various character.

FROM THE FLOOR: If collection of refuse is 80 per cent of the cost, do you think you will get involved in trying to get organized collection to reduce overall cost?

MR. REID: This is an engineering problem that I can't answer. I just don't know.

FROM THE FLOOR: It is a planning function, however.

MR. REID: No, I don't think this is a physical planning function. It is a planning operation.

FROM THE FLOOR: Another question. Did you submit this total package to FFHA, or did you submit this in phases and get approval of certain phases on completion of the previous phase?

MR. REID: We did it as a total project.

FROM THE FLOOR: Last question. How did you approach these communities, or how did you get the one-third contribution, your share?

MR. REID: We took it out of our budget which comes from the county.

REVIEW OF FEDERAL AND STATE LEGISLATION

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Federal Legislation Relating to Solid Wastes

There is very little Federal legislation relating specifically to community solid wastes. There are, of course, numerous Federal statutes and regulations prohibiting the deposit of refuse in harbors, navigable waters, and on government property. There are requirements concerning the provision and control of solid waste services at installations and projects under Federal jurisdiction. There is also an Interstate Quarantine Regulation of the Public Health Service requiring the heat treatment of garbage transported across State lines for hog feeding purposes.[1] But there is no Federal legislation at present to assist States in developing comprehensive programs for handling and disposal of community solid wastes or specifically authorizing research and demonstration projects leading to more effective waste disposal. The Public Health Service has over the years conducted some limited activities in the solid waste field under its general authority in relation to communicable disease control. Under the general authority contained in Section 301 of the Public Health Service Act some research activities have been undertaken. I understand a report will be given on the current Public Health Service solid waste research activities tomorrow afternoon.

In past years a number of bills dealing with solid wastes have been introduced in the Federal Congress but none have been enacted into law. There are several bills on this subject now pending before the 89th Congress. The Senate has passed a Solid Waste Disposal Act as Title II of S. 306, a bill which also amends the Clean Air Act. The House Committee on Interstate and Foreign Commerce, to whom S. 306 was referred, has reported out the bill. Title II of S. 306, the Solid Waste Disposal Act, as reported by the House is quite similar to the Senate passed version and I will give a brief description of what is contained in the House reported version of this Act.

The "Solid Waste Disposal Act" Title II, S. 306 (as reported out by the House Interstate and Foreign Commerce Committee)*

The Solid Waste Disposal Act as reported out by the House Interstate and Foreign Commerce Committee on August 31, 1965,

* - Editor's note: Passed by Congress, effective Oct. 20, 1965.

provides for a national research and development program relating to solid wastes, and provides financial assistance to State and local governments and interstate agencies in planning, developing, and conducting waste disposal programs.

The responsibility for the administration of the program at the Federal level is vested in the Department of Health, Education, and Welfare, except that the Department of Interior would deal with solid waste problems in some respects where the extraction, processing, or utilization of minerals or fossil fuels are involved.

Specific authority is given to the Secretary of the Department of Health, Education, and Welfare to conduct and encourage, cooperate with, and render financial and other assistance to public and private agencies and individuals for the conduct of research, investigations, training, and surveys relating to the operation and financing of a solid waste program, and for the development and application of new and improved methods of handling solid wastes.

The Secretary may make grants-in-aid for research, training projects, surveys, and demonstrations, including construction of facilities, and may also contract for these activities. The Act provides that no grant will be made which would result in the Federal Government paying in excess of two-thirds of the construction costs of any facility. The Secretary is authorized to collect and publish results of and other information pertaining to research and other activities relating to solid wastes and to make recommendations as may be appropriate.

A section of the Act requires the Secretary to encourage cooperative activities by the State and local governments in connection with solid waste programs including their planning and operation, and to promote the enactment of improved and, where practicable, uniform State and local legislation for solid waste activities.

A very important section of the Act authorizes the Secretary of the Department of Health, Education, and Welfare to make grants to State and interstate agencies of up to 50 percent of the cost of making surveys of solid waste handling practices and problems and for developing plans for effective solid waste collection and disposal systems. In order to be eligible for such grants the applicant must: (1) designate a single agency to carry out the purposes of the Act, (2) provide for full consideration of all aspects of planning the proper solid waste handling consistent with the protection of the public health, (3) set forth plans for expenditure of the grant which provide reasonable assurance its purpose will be carried out, (4) provide for submission of a final report, and, of course, (5) provide for adequate fiscal control and fund accounting. Assurance must also be given that the planning of solid waste disposal will be coordinated to the extent practicable with other related planning activities.

The Act authorizes to be appropriated to the Secretary of Health, Education, and Welfare 7 million dollars for fiscal year 1966, 14 million dollars for fiscal year 1967, 19.2 million dollars for fiscal year 1968, and 20 million dollars for the fiscal year 1969.

There is authorized to be appropriated to the Secretary of Interior for these years: 3 million dollars, 1966; 6 million dollars, 1967; 10.8 million dollars, 1968; 12.5 million dollars, 1969.

If this legislation is enacted, I am sure we will see solid waste activities developing into much more significant programs at the Federal, State and local levels of government. If most of us here did not already know from personal knowledge, I am sure we would find that the evidence accumulated in the development of this legislation and the findings of Congress set out in the House bill clearly indicate the need for the emphasis on solid waste activities which the legislation is designed to bring about.

Legislation for State and Local Programs on Solid Wastes

There has been very little detailed information compiled and published indicating the extent of State legislative authority to conduct State level programs of solid waste control. The Public Health Service did, however, send out a questionnaire about two years ago to the various States concerning the status of State health department solid waste programs and included the results of the questionnaire in a report it later issued.[2] In regard to the question as to whether State health department responsibility in the solid waste field was covered by any specific legislative authority, 32 States gave a "yes" or "qualified yes" answer while 18 answered "no." For those States that reported legal authority in this area of activity, the report did not contain detailed information concerning the extent and type of responsibility and programs authorized by the legislation. It did indicate that the legal authority reported by some of the States was based upon its general health or nuisance laws for controlling wastes and similar problems. The report also indicated that only a few States had specific legislation providing authority for the State health departments to conduct a broad program for the control of the storage, collection, and disposal of solid wastes, and that there is generally a lack of clearly defined responsibility for solid waste control programs at the State level.

I understand that all or practically all of the States do have legislation requiring the heat treatment of garbage before it may be used for hog feeding purposes.

It would seem that if problems of solid wastes are to be given adequate attention in a given State and if significant State level programs are to be developed, there is, as a minimum, a need for basic legal authority and a legislative mandate for the appropriate State agency to conduct an active solid waste program including furnishing technical assistance to local governmental bodies responsible for collecting and disposing of solid wastes, for providing assistance in making surveys and studies, and for developing plans and necessary local regulatory control programs in regard to solid wastes.

Among other matters, consideration should no doubt be given at some stage in the development of a State solid waste control program to requiring a method of State or local approval of plans for disposal facilities. A few States have already provided such a requirement. Consideration should perhaps also be given to requiring the certification of operators of solid waste disposal facilities similar to such requirements the States have for certifying water and sewage treatment plant operators.

I doubt if it has been finally determined, and I am certainly not prepared to suggest, just what should be included in a State-level solid waste control program and what type of legal and regulatory authority is necessary or appropriate for administering at the State level. The proposed Federal legislation on solid wastes, discussed earlier, would authorize studies in this regard and would provide for the development and promotion of improved State and local legislation.

The States seem to have done somewhat better in providing necessary legal authority for the local control and operation of solid waste programs than they have in establishing State level programs, although there is normally no mandate to exercise such authority. A brief look at the municipal and county codes of several States would indicate that municipalities in almost all cases and counties and some other political subdivisions in many instances have substantially satisfactory authority to operate or control the operation of local solid waste activities. Most often there seems to be a lack of adequate legal authority to deal effectively with solid waste problems in metropolitan areas where such problems are most acute, of course. As with other utility type services, it may be impractical and too costly to have ten or twenty different solid waste collection systems operating in one general urban area. The 1962 Census of Governments[3] indicates that only nine States have provided for the establishment of special districts or authorities to operate a single coordinated solid waste system for an entire metropolitan area or other area embracing several or more separate political subdivisions.

Some States authorize the existing political subdivisions to contract or otherwise arrange with each other in providing coordinated solid waste collection and disposal services. While it is possible to have a coordinated collection and disposal system for an urban area through the use of contracts and cooperative agreements among the various political entities, this is difficult to attain where a dozen or so jurisdictions are involved and the continued existence of such an arrangement is always in jeopardy when contracts expire or where they may be terminated for some reason. The authority to establish a permanent special function district to provide the service for an entire urban area is one method of meeting the problem.

It would be a major project to review and analyze the laws and regulations of the States to determine what legal authority is available to cope with local solid waste problems and to evaluate the adequacy of such legislation in order to give a summary of such legislation. These laws are usually scattered throughout the State codes, are not uniform in any respect and do not lend themselves to easy assembly, evaluation, or comparison.

However, I will give a brief general rundown of the legislative authority available to cope with local solid waste activities for Ohio where this course is being held in order to give you examples of the extent and variety of this type of legislation. You who are not from Ohio would find, I'm sure, that you have somewhat similar legislation in many respects. I have selected Ohio because I am familiar with and have available the Ohio State Code and am able to find, I hope, the pertinent Ohio solid waste laws.

Ohio does provide examples of the several types of legislative authority which are necessary for the conduct of practically any local solid waste responsibility by the several categories of political subdivisions or agencies that are concerned with this responsibility.

It has three types of political subdivisions with general governmental authority--municipalities, counties and townships. Each of these have specific legislative authority to provide for a collection and disposal system for solid wastes. In addition, a special purpose political subdivision may also be established to perform certain functions, among which are solid waste collection and disposal.

The municipal corporation in Ohio would seem to have ample legal authority to establish, operate and control solid waste activities. A municipal corporation in Ohio may:

(1) Establish a community solid waste collection and disposal system.[4]

(2) Adopt by ordinance and regulation requirements concerning storage, transportation, and disposal of solid wastes.[5]

(3) Contract with other municipal corporations, counties, individuals or private corporations and grant franchises or exclusive rights for providing collection and disposal services for the municipality.[6]

(4) Appropriate land within and outside the corporation limits for disposal facilities.[7]

(5) Abate any nuisance caused by the improper handling of solid wastes.[8]

(6) Finance the cost of purchasing land, facilities, and equipment for a solid waste collection and disposal system from general tax funds, by issuing general obligation bonds, mortgage revenue bonds, or with proceeds from a special tax levy.[9]

(7) Finance the operational costs and pay off the bonds for a solid waste disposal collection and disposal system from general tax fund, service charges, or proceeds from a special tax levy.[9]

(8) Contract with other municipalities or with townships for the joint construction, operation, and maintenance of disposal facilities.[10]

Counties in Ohio also have extensive authority to establish solid waste collection and disposal systems. An Ohio county may:

(1) Establish one or more solid waste collection and disposal districts in the county outside municipal corporations.[11]

(2) Adopt rules and regulations for the operation of the collection and disposal system, including the storage of waste for collection.[12]

(3) Require approval of all solid waste disposal systems set up in the county after a district has been established.[13]

(4) Finance the cost of purchasing land, facilities, and equipment for a solid waste collection and disposal system by the issuance of revenue bonds, and by general obligation bonds, and finance the operational costs from service charges.[14]

(5) Contract with municipal corporations and townships for furnishing solid waste disposal services.[15] In fact, under Section 307.15, Ohio Revised Code, the county commissioners may enter into an agreement with any of the other political subdivisions of the State and exercise any power, and perform any function or service in behalf of the contracting subdivisions which such subdivision can perform.

(6) Employ an inspector to enforce laws against nuisance caused by improper waste handling.[16]

The township in Ohio also has authority to provide for the collection and disposal of solid wastes. It may:

(1) Create a waste disposal district and operate a collection and disposal system.[17]

(2) Contract with municipal or county authorities or with independent contractors for collection and disposal of solid wastes.[18]

(3) Make a tax levy or make service charges to provide and operate the collection and disposal service.[19]

The Special District

A special sanitary district can be established in Ohio for the collection and disposal of solid wastes, and for other purposes.[20] Under the Act authorizing this special purpose political subdivision, bonds can be issued to finance the improvements necessary, and assessments can be levied on the real property in the district to pay off the bonds and to provide for operating expenses. I do not believe that any sanitary district has been established under this Act for the collection and disposal of solid wastes. Such a district could be established to handle the solid wastes activities for an entire metropolitan area.

The 106th (1965) General Assembly of Ohio adopted Senate Joint Resolution #5 proposing to amend the Ohio Constitution which, if approved by the voters, will authorize the formation of urban service authorities. If this proposed amendment is adopted, urban service authorities may be formed by charter with authority to perform any function that municipalities, counties or townships can perform. This would, of course, include establishing, financing and operating solid waste collection and disposal systems.

Other Legislation

Regional and county planning commissions in Ohio may make studies, plans, and reports for the region or county showing the commission's recommendations for various public improvements including refuse disposal.[21]

There are, of course, many other provisions in the State statutes relating to the control of solid wastes. Boards of health of health districts have rather extensive authority to regulate the storage, collection and disposal of solid wastes. There are also the general misdemeanor statutes relating to nuisances, littering and similar problems caused by improper solid waste handling which may be enforced by local authorities. Similar statutes exist in all States.

Summary

To summarize briefly concerning this subject of legislation for implementing community solid waste control programs, there are prospects for Federal legislation providing broad assistance in this regard; there is not much State legislation designed specifically for the purpose of conducting or developing appropriate State level programs of solid waste control; municipalities in most States and other political subdivisions in some States have authority to conduct solid waste operations; and adequate legislative authority to cope with the solid waste problem in metropolitan areas is not available in a large majority of the States.

References

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2. "Solid Waste Handling in Metropolitan Areas." Division of Environmental Engineering and Food Protection, Public Health Service, February 1964.

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4. Article XVIII, Sections 3 and 4, Ohio Constitution; Sections 715.43, 3707.41, Ohio Revised Code.

5. Article XVIII, Section 3, Ohio Constitution; Sections 715.43, 715.44, Ohio Revised Code.

6. Article XVIII, Section 4, Ohio Constitution; Section 3707.42, et seq., Ohio Revised Code; Sections 307.15, 343.02, Ohio Revised Code.

7. Sections 719.01, 719.02, Ohio Revised Code.

8. Section 715.44, Ohio Revised Code.

9. Article XVIII, Sections 3, 12, Ohio Constitution; Sections 133.03, 113.09 to 113.13, Ohio Revised Code, Chapter 5705, Ohio Revised Code.

10. Sections 715.02, 3707.44, Ohio Revised Code.

11. Chapter 343, Ohio Revised Code.

12. Section 343.01, Ohio Revised Code.

13. Section 343.01, Ohio Revised Code.

14. Sections 343.07, 343.08, Ohio Revised Code.

15. Sections 343.02, 307.15, Ohio Revised Code.

16. Section 3767.27, Ohio Revised Code.

17. Sections 505.12, 505.27, et seq., Ohio Revised Code.

18. Section 505.27, Ohio Revised Code.

19. Section 505.29, Ohio Revised Code.

20. Chapter 6115, Ohio Revised Code.

21. Section 713.23, Ohio Revised Code.

PANEL DISCUSSION OF VARIOUS APPROACHES

Messrs.: Reid, Coleman, Overman, Crane

MR. REID: I am pinch hitting for Norm Tucker who isn't here today as chairman of this panel session. You have already had an opportunity or agony of listening to me and the previous speaker. There is another who should be on the platform with us now, Mr. John Coleman.

He will have an opportunity to make his presentation and then we will have the panel presentation.

Mr. Coleman is the executive director of the Ohio Municipal League. Since March, 1956, he has held this position. Most of you probably know the Municipal League is a voluntary association of cities, villages, and their headquarters are located in Columbus.

Prior to March, 1956, Mr. Coleman served as a governmental bureau research director of Syracuse, New York. This is privately financed by a taxpayer group for the promotion of efficient and economical government.

In this position, he made numerous studies of municipal and county administration and finance. He has worked as a research aid in the Bureau of Research, Department of Audit and Control, State of New York, and also served as a consultant for the New York State Commission on the Fiscal Affairs of State Government. He has also served as a member of the Executive Committee of the National League of Cities which is a national organization representing over 13,000 municipalities throughout the country. Detroit had the privilege of being the host to their conference last fall.

At present, he is also serving as a member of the Joint Highway Committee of the National League of Cities, the American Association of State Highway Officials, and the National Association of Counties. He is a member of the Board of Directors of the Ohio Conference.

He received his academic training at Michigan State University.

You now hear from Mr. John P. Coleman.

MR. COLEMAN: Thank you for the introduction. I think my approach is going to be different because I am not an expert in the field of solid waste. I won't give you any ideas or programs with which I have been intimately acquainted. I would like to set forth some thoughts that I have had in the general field of trying to implement a program of the nature of the subject in which you people have been involved in the short course.

I think an examination of the content of this program, as well as the speakers, at least up to this point, indicates that the professional talent, the expertness, is available to solve these problems. I'm assuming that this implementation panel has been included for the purpose of examining how this expertness can be moved into an action program. This implementation will involve policymakers within our governmental structures. I am sure that there are people in attendance today who would suggest that perhaps the implementation of any governmental program may be the most difficult.

The so-called foot dragging which may take place at city hall or at the court house or even at the state house is sometimes difficult for the professional public servant to understand or accept. Since the end of World War II, there has been an ever increasing concern about the problems of an urban society. This concern has been expressed by both the politician and the political leader.

There is a serious question as to whether or not the metropolitan areas in this country can afford the luxury of another twenty years of discussion. It is not new to any of us that we are a nation of urban dwellers. This trend will continue. There will be a further concentration in population in our metropolitan areas, but at the same time, within these metropolitan areas, there will be a decentralization and a continued growth outward from our core cities.

In the consideration of solutions and the implementation of programs to resolve our urban problems, we must work with what we have, and the facts as they exist, no matter how greatly we might wish that these conditions did not exist.

In our typical metropolitan area, we usually have a multiplicity of governmental units. This is a point from which we must start. The wealth of our nation is also located in our urban areas; however, this financial resource may not be available at the right place or at the right time. This is the framework within which both the professional and the political leader must operate when attempting to meet the problems of an urban area.

The collection and disposal of solid waste is one of the problems facing our urban centers. Certainly not one of the most glamorous issues, but a problem which demands an effective solution.

I believe the problem of disposal is more difficult from the standpoint of effectively implementing a program which will provide a long-range solution. I might suggest several reasons why I believe this is so. At least in the past, in my opinion, there hasn't been enough concern on the part of the government officials in the policy-making areas. There are budgetary limitations. There are competing demands on the supply of the tax dollar, not only among the departments within a city political subdivision, but a tremendous competition for the tax dollar among all the units of local government at the local level.

Public apathy. The man on the street apparently has little concern about the problem of waste disposal unless the waste disposal facility is to be located in his neighborhood, and there suddenly develops a tremendous interest, practically all of it negative. This apathy is also translated into a resistance to requests for additional tax dollars to handle the problems which the citizen himself creates.

What can be done in the area of implementation of programs? As a non-expert, let me suggest a few obvious things. I think there is need for a long-range plan. The need for this plan has been recognized in the format of this short course.

I believe that the need for long-range planning cannot be emphasized too strongly, and in the metropolitan areas, especially, this must be done on an area-wide basis and must include all the governmental units involved in any way. Even those units of government at the local level which at present may feel they are not involved in this issue because, as an example, the collection of refuse is now handled by a private hauler who is also responsible for its disposal, but whether it is a public or a private hauler, the problem is still there and some morning those areas now serviced by private haulers will awaken to learn that the private hauler has no place to dispose of his product.

Data must be developed so the scope of the problem can be designed not only in terms of current need, but also in terms of future needs. If possible, make use of the talents available on the staffs of existing regional planning commissions such as we have here in Ohio in practically every one of our metropolitan counties. Translate the planning process into specific recommendations for solutions of the area-wide problem, placing a dollar figure on the various solutions which can be afforded for consideration. This will be the first question asked by the policymakers.

Don't be afraid to place the program in its proper priority rating in relation to other governmental needs. There is nothing like a crisis or pending crisis to gain attention.

If we refuse to do a good job of planning, we must be willing to accept the fact that a solution to the problem will be found anyway, and chances are it will be the most specific solution which could have been devised.

We need assistance from state legislatures. Stead Overman has covered this area pretty well, but I think it is an important area of local government to see that the local government has the tools available to them to do the most effective job possible. Certainly there should be broad authority for all units of local government to cooperate with each other for the purpose of jointly conducting the functions of government.

As Stead Overman has indicated, the State of Ohio has given broad authority to municipalities and counties in particular to cooperate with one another to carry out the responsibilities of local government. The state legislature in Ohio has in the past been very receptive to changes necessary in the state laws to remove certain technical difficulties encountered when local units of government attempt to work together toward the solution of a mutual problem.

An example of this was the passage of House Bill 161 in the just ended current 106th session of our General Assembly.

House Bill 161 was brought about as a result of a number of counties -- within a number of counties the local officials were examining the possibilities of a cooperative approach to the problem of refuse disposal. Authority did exist for the county to create disposal districts; however, as the law was examined in relation to the programs which were being considered, a number of deficiencies were found and legislation was introduced in the form of House Bill 161 to meet these major deficiencies.

Also included in this legislation, in its original form, was a major revision in the state law which would have removed bonded and bond-anticipation notes issued by the county for the purpose of refuse collection and disposal facilities from the net indebtedness permitted for counties without a vote of the people. The legislation in its original form passed the House with practically no opposition, was reported out of our urban affairs committee in the Senate with no opposition, and recommended for passage. It arrived on the Senate floor with all the supporters in full hope and full expectation that it would be passed in its form, but as it appeared on the floor, strong debate developed, and the provision relative to the net indebtedness was deleted from the proposed legislation. This was probably the most important part of the whole bill. It was deleted under the pretext of saving money for the property taxpayer.

I point this out to illustrate a need which exists and not only in Ohio, but in most other states in this nation. Local units of government are expected to operate under debt limitations and property tax limitations imposed in the early thirties. Obviously the need of that period in our history is not the need of today.

How often have you heard the plea that local government should handle local problems? They can't expect to handle properly their problems unless the state legislature is willing to remove or modify the obsolete limitations and restrictions now imposed on their ability to effectively handle local problems.

The ironical part of property tax limitations and debt limitations are that these limitations were imposed originally, and maybe there was justification originally, but they were imposed to protect the property taxpayer from the government spenders, but today actually this so-called protection is costing the property taxpayer money in dollars because the problem of waste disposal, I don't care what problem it is, water pollution or waste disposal, the problem is still there regardless of whether the limitations are there. Problems will have to be solved. They are not going to go away just because there is a limitation. What has happened, for example, in Ohio, our local governmental units have had to go to the other means and more expensive means of financing in order to get around the property and debt limitations. A property taxpayer, under the guise of protection, instead of paying 3.5 interest on a bond, in the small communities may find he is paying four per cent interest on a forty-year revenue bond. If this is protection for the taxpayer, protect me from the protectors because it is an easy way to solve a problem which is not going to disappear just because of the debt limitation.

Stead Overman indicated, and I agree with him wholeheartedly, that the state government can provide a service to our small communities, especially, and this is in the area of technical assistance. We can argue and there are arguments as to the proper role of the state government in meeting the problems of our urban areas. In my opinion, there certainly is a minimum role which the state should assume and this is in the field of technical assistance.

Some of our communities, especially the smaller ones, it is impossible for them to hire the type of people necessary to handle some of these problems.

I have always been an advocate of strong and effective local government. I have been an advocate of close cooperation at the local level between all the local government units, cooperation toward the solution of area-wide problems. I believe local governmental officials must accept their responsibility to meet the challenges which face us here today. The day-to-day problems of our urban society are, in effect, sitting on the front steps of city hall or the court house and they can't be referred to a lower level of government.

MR. REID: Thank you, Mr. Coleman.

I have a hunch that we will get the most value out of this panel if it operates both horizontally and vertically. We might start to discuss up here and push it out so we get it tossed back and forth.

To start this ball rolling horizontally, I would like to ask Mr. Overman a question.

Some seven or eight years ago, the head of the Department of Public Works in Detroit who was concerned with transportation, a state representative of the state highway commission, and the city planner of Detroit, and I went to Washington to meet for the first high level conference between the Bureau of Public Roads people and Housing and Home Finance people with the plea that somehow or other, they get together at the top so they could jointly help us in metropolitan areas in making transportation and land use studies. This was so fruitful, it finally took root and grew, and some years back we got an agreement from the Bureau of Federal Roads and Housing and Home Finance Corporation. They agreed to assist in a transportation and land use study plan.

I would like to ask Mr. Overman if he sees any chance that there will be a similar arrangement between the Public Health Service and the HHFA in getting joint projects in regard to solid waste disposal plans and programs in metropolitan areas?

MR. OVERMAN: I certainly think there is a possibility of doing that. I am sure two agencies are already working together on a lot of these common problems. They are, and I am sure they will continue to. Any other programs or possible suggestion by Mr. Reid similar to that would certainly be given consideration and probably put into effect. There is no question that the two agencies are both concerned with this problem and they are going to work together. They do work together and they will continue to do so.

MR. REID: I am trying to stir up some encouragement at the top. I have already talked to Oscar Suttermeister about this who was a planner and consultant to the Public Health Service. We talked about this at the American Institute of Planning.

Let me ask this. In your respective areas, are there chances or actual cases of close cooperation between Public Health Service and physical planning agencies in developing studies and programs for solid waste disposal? Have we got any case of that kind?

FROM THE FLOOR: This is not an actual case in being, it is a case in prospect where the planning commission of Lake County would no doubt cooperate with the public health officials, one of whom is here, the sanitary engineer, one of whose representatives is here, the recreation director, and the many municipalities and many municipal officials in developing plans insofar as I think you pointed the way in outlining the need to get all the people involved right from the start.

This will provide an excellent frame of reference. I would like to carry this back and hopefully get the support of my fellow representatives from Lake County, Ohio, to make a report to the planning commission and also the county officials.

MR. REID: The reason I am anxious to get the idea fermenting is that we are not only concerned about getting a plan, but putting it into action.

As Mr. Coleman said and as Mr. Overman said, this involves not doing just the physical and organizational planning, but the steps whereby demonstration grants or other construction grants can be of assistance.

To be specific, regional planning agencies now are asked to review public works projects that have to do with anti-pollution controls of various measures, whether they are interceptor sewers, treatment plants, and so on.

We got one the other day from a community in the Detroit area that combined a treatment system with a solid waste disposal system, expecting to utilize the by-product of these two processes for some economic end.

This is a point where we stumble because we weren't sure what the economic end might be, but increasing, as federal aid is extended, for studies and construction projects in the metropolitan areas, the planning commissions are going to have the responsibility of reviewing these plans to see whether they fit into the general overall comprehensive plan, and give back into such a plan this part of the metropolitan system.

We have broken the ice here. What comments do you have about implementation programs? I think we have outlined that there are several points here that the study to formulate a plan and program necessarily involves technical aspects of collection and disposal of waste, it involves organizational aspects and how you do this on an intergovernmental basis with the many legal ramifications that Mr. Overman presented, and it also involves financial support for such an intergovernmental program.

Out of this process of developing a plan and program is generated part of the steam power or electric power or whatever you have to implement a program and put it on the ground.

How do you stand in your community and in your areas in approaching it on this sort of a tri-legged utilitarian basis?

FROM THE FLOOR: I know of three states that require submission of designs for approval to either the State Health Board or, in one case, the Industrial Commission.

Leo Flood is a representative of one which excludes certain metropolitan areas from this, and my friend, Pat, back here, is from the other.

The third one does not have any representative here. That is the state of Wisconsin. I would like to have these two gentlemen comment on their state legislatures that give them control over pollution statewide.

MR. FLOOD: The air pollution activity of New York City first started in 1949. The Department of Air Pollution Control was established in 1952. The State Board of Air Pollution Control was only established about 1958, so we more or less were the pioneers and had to break ground for this activity, so that when the state board was formed, they came to us with an executive director and some of the representatives to see how we were handling it.

Then, they more or less patterned their procedures after ours. I must confess, they made some improvements on our procedures. They didn't want to duplicate our work, nor did they want to put us out of business. They did want to examine all plans, grants, and test installations in New York State which they are doing now, so the law provided that certain agencies, after review by the State Board of Air Pollution Control as to their procedures and their competence and technical assistance and so on, could be exempted from the requirement that they obtain permits from the state and subject themselves to state regulation; that is, the municipality would take that phase of it. This is the way it is now.

As far as I know, there are only two municipalities in New York State which have been approved by the state. The first is New York City and I believe the other is White Plains, possibly New Rochelle, and the county of Westchester.

You asked about the planning agencies and solid waste. What I have to say is not the question of planning agency and other agencies in that aspect, but as far as zoning and air pollution are concerned.

New York City has a new zoning resolution. This has been in effect for about thirty years. Incorporated into this zoning regulation controls are air pollution. They limit the smoke which may be emitted in certain districts, manufacturing, commercial, and residential; deals with noxious gases, odors, and so forth.

We jointly set these limits. I was a representative of the Department of Air Pollution on the group that did this, and we took advantage of this in order to strengthen our regulation and put a regulation in the zoning resolution that whichever limit was the more restrictive would be the one that would govern. Since that time, we ourselves have upgraded our own rules and regulations on emission limits, so that they are equal to or better than the ones in the zoning regulation.

This program has not been entirely implemented because the new industries coming into the city, relocating in the city, of course, have to relocate in areas that are zoned for that kind of industry. We feel that these should have a prior review by the Department of Air Pollution Control to make sure that they understand what limits they have to meet as far as emissions are concerned, so that they may provide this in their original plans before they decide to come in.

This is still in a state of flux. It has been admitted to the Building Administrator, the Zoning Board, and also to the Planning Commission.

MR. REID: Let me be impertinent and ask: Have you had trouble with incinerators as a part of your anti-pollution program?

MR. FLOOD: Yes, we have, not only city incinerators, but also incinerators on-site, that is, in apartment buildings.

Early in the 1950s, because solid waste was a problem and we weren't building incinerators fast enough in New York City, a local law was passed that all municipal dwellings over four stories in height, accommodating twelve families, would have to provide incinerators.

At that time, there was no floor under the design feature so they could put in anything at all that could scorch or burn the refuse before the Department of Sanitation picked it up.

We came into business after this law was passed and as quickly as we could, we formulated minimum design criteria for these apartment house incinerators. We didn't know all the answers at first as to the development. We did require what we were sure would help. We found out later that some of these things did not help and we had to change them.

I think, however, that we have now reached the point in our design criteria where certainly the apartment house incinerator, built according to these criteria, and properly maintained and operated, does a better job as far as air pollution is concerned than do the central city incinerators, so that not only do they do a better job air pollution-wise, but also do a better job of reduction in many cases.

In spite of this, we don't think the desirable thing is to have all of these sources of pollution in apartment buildings. We would rather have the Department of Sanitation pick up all the refuse and take it to a central incinerator which, hopefully, will be designed in such a way that it can meet the same standards of emission as we require of the public utility power plant. This is not the case now.

The entire subject of solid waste disposal is at present being reviewed by the city administration and the departments involved, the departments being the Department of Sanitation, the Department of Public Works, responsible for the design of incinerators, the fire department, the health department, and the Department of Air Pollution Control.

The matter is also being investigated by the city council, not only to improve the city incinerator, but possibly to utilize it for generating steam, not only to help the incineration process, but also this heat which is available in the refuse, if put to use, will mean that a similar amount of fossil fuel will not have to be burned, and since the fossil fuel emits sulfur dioxide when burned, this is a pressing problem in New York City at the present time.

This matter of apartment house incinerators encountering such a problem in New York City, serious consideration has been given to prohibiting their use, in other words, outlawing them. The immediate problem would be: What would we do with the refuse if this were done?

The Sanitation Department reported that extra cost would be about 18 million dollars a year if they had to handle all the refuse that is now being burned by apartment houses.

Furthermore, the apartment dweller has become used to the convenience of the chute in the hall in order to chute the stuff down. I don't know what the outcome is going to be, but from my point of view, I would prefer, as I said before, to have the efficient, nuisance free central incinerator than all of the on-site burning associated with it. The apartment on-site burning is not the only thing we are concerned with. We are also concerned with industrial burning and commercial burning from department stores. We can control the new ones pretty well, requiring that they have the ultimate control and design features in them.

I might say that the National Academy of Science, at the instance of the Federal Housing Authority, a year or so ago formed, under the Building Research Advisory Board, an ad hoc committee to go over this matter of apartment house incinerators and come up with minimum standards, and I happened to be a member of that committee which acted on that.

The report has recently been published. I have my copy over in my room and I will be glad to give the reference on it so that anyone here interested in it may get it. I think it costs two dollars. Our latest criteria provide, as do the BRAB publication, for accrual separate from the chute, so that we don't have the problem of having absolutely no control over the kind of fuel which is being fed to the incinerator, which is fundamental to this type of fuel, nor do the problems created by the intermittent feed -- anybody can throw anything down at anytime, nor to the problems created by a varying draft which varies because anybody can open the hopper door and change the draft around.

Another very serious thing that this chute plus flue incinerator will overcome is the problem of smoke-out, or gas-out, as they are sometimes called. This is a condition where, when the incinerator is burning, in the upper floors of the building where the stack above the outlet does not give too much of a draft, there may be an exhaust fan in the corridor, smoke and gases will actually be drawn through crevices around the hopper door into the corridors creating a nuisance and a danger for the tenants on the upper floors.

I hope I am not too optimistic about the new criteria of ours, but incinerators being built since then have worked out very well. This does not, however, give the design parameters -- nor does it obviate the necessity of having good workmanship and good construction. When we get troubles of this kind through the smoke-out, we go to investigators.

We find that more often than not, it is due to some basic defect in the construction of the flue.

I recall a luxury apartment building in Central Park South, New York City, where they had this problem of smoke-out and gas-out on the upper floors. We investigated them and we found that there were holes in the flue that you could put your fist through and the floor slabs in some cases would project maybe four inches into the flue so you would have stoppages and leakages.

We finally pointed this out to them, what the trouble was, and they finally eliminated it because, by patching up as best they could the defects in the flue which never should have occurred if the construction was carried on under proper supervision and provided an induced draft fan at the roof level in order to provide a negative draft in the flue at a higher level, so we wouldn't have the smoke-outs.

I happen to have also in my room only five or six copies of our latest criteria on the residential incinerator. I will bring those here this afternoon and anybody who is really interested can get a copy from me or write to our department.

MR. REID: There is a warning in what was said about the New York situation to our Detroit area. We have followed pretty closely the proportion between single family residence construction and multi-family residences. In the last five years, the proportion of the average of 20,000 new homes a year in multiple structures have gone up from 7 per cent to 34 per cent, and most of this is outside the central city, so I can see that we have got to watch this problem of what is done in the multiple structures in regard to incinerators, and solid waste disposal.

Will the second example named by Amos stand up?

From what state are you?

FROM THE FLOOR: Florida.

MR. REID: All right.

FROM THE FLOOR: Basically, in Florida we operate under a statute which gives the State Board of Health certain powers to promulgate rules and regulations pertaining to various fields of health which include solid waste disposal.

In line with this, the Board has promulgated a chapter of the State Code to cover solid waste disposal. I did some objecting, and as a result, I got put on the committee to help rewrite the chapter.

The way the thing is written, it incorporates several of the rules mentioned in the ASCE booklet on sanitary landfills. We put these into the effective law in the operation of a sanitary landfill.

We have a detailed section on incinerators, what we call package incinerators, up to 1000 pounds per hour, and then we leave the larger ones over this as being subject to review on the basis of good engineering judgment.

The lawyers don't appreciate this because they like everything one, two, three. They want it so they can nail it down very tightly, but we feel that the field is changing and I think what Mr. Flood has said certainly would reinforce this. We think there has been a tremendous improvement in the large incinerators which have been built in Florida.

We have an open end clause section in there on composting so when people come in to talk about composting, we can talk to them on the basis of good engineering judgment.

Regardless of what our lawyer seems to think, we believe this is a good clause because this leaves us free to maneuver.

I might comment, I think a lot of our experiences have been similar to Mr. Flood's as far as incinerators are concerned. We have had a lot of problems. I might add that there were a lot of them installed before the chapter became effective, so we have quite a few of these available that are being installed under what we call the grandfather clause which is a favorite for lawyers and some people.

We feel that the situation is improving and I think the way our board operates, if we see something that needs changing, we can change it under this chapter of the Code.

The big gap is that there is no provision in any of our laws at the present time for solid waste districts or something of that nature. We have several places in the state where we have water and sewer districts, where we can set the thing up overall. We do have one county that has set up, under special local legislation, collection districts. In this case, they franchise a dealer under a very strict contract to give him a territory. They have a map for everybody to see in the court house, and he has to stay in his territory and live by certain rules.

I think this has solved their collection problem, but unfortunately, they haven't gotten around to what they are going to do with it after the collectors pick it up, bring it somewhere, and what they are using, really, is what I call open dumps. They call them landfills.

Somebody said we should leave off the word "sanitary" yesterday. These are definitely not sanitary.

We are very close to hiring an engineering firm to make a feasibility study to show where we can go from there.

We have the difficulty that in so many cases you have jealousy between the county officials and various public officials as well as the cities and the counties. This is a real hard nut to crack. This is going to require a real selling job to get these people to work together. I think somebody is going to have to show them where it is cheaper for all citizens in the county to get in this thing together.

If I may digress a little bit, we have a situation down there that has occurred several times in the past as far as installation of water systems, sewer systems, and so forth. They use what they call revenue certificates or revenue bonds. These are supported by the usual charge.

There is financial backing on the part of the issuing authority, city, county, or what-have-you. This obviates the need for passage by the voters of general obligation bonds.

As far as this business of cooperation, we have been working on a revision to our air pollution chapter which will be separate from the solid waste chapter of the code. We have had a lot of trouble with gypsy asphalt plants. The state road contracts let the contract for a small stretch of road, and then this small operator comes in and brings in a portable asphalt plant and sets it up and puts up a cloud of dust and smoke. We have not set any standards and we have had two or three of these situations arise, and when we talk to them, they say that we have no standards and so we can't do anything unless it becomes a physical health hazard.

Gentlemen, this is almost impossible to prove. We have had studies. We have had different types of asphalt plants, some of which have been very satisfactory types. We have a range of value from up here to down here.

We brought the State Highway Department in on this business and we have an agreement, that, when this becomes effective, they will write in the contract that they will not buy asphalt from any such purchaser unless he conforms to the State Board of Health rules. This is going to be a very powerful tool.

I might add here at this point that the rules at the present time have the big gap in them. The biggest gap in the solid waste picture is the lack of people to enforce the rules. Quite frequently it comes back on the county health department, at the county level, or trying to get somebody at the city level to enforce it and they have their hands full.

They have more than they can do. This is the biggest gap in the entire picture now. It is a big weakness, a big loophole. We have not been able to get people to enforce this situation.

FROM THE FLOOR: I am not from Wisconsin, but I will speak for them. This is not from the horse's mouth, but I happened to serve on a commission for years that formulated this, and I also hold a license there, so I do get part of the code.

All incinerators, boilers, and other pollutants, are submitted to the state industrial commission at the present time. There is a subdivision there, I don't know just the terminology they use, and also are building designs on air removal and so forth. If you have a grinding operation, you meet certain minimum standards and they must be submitted.

The inside of a building, they have a legal right. They can tie you up -- having been a plain engineer there, I know. If you do not have a certain criteria inside the building, they can tie you up. In writing the law for the air pollution, they have got the limitation, but there is no police power.

They submit or request the best word, because not having a legal way to enforce it, they enforce that all designs of pollutants be submitted to the industrial commission. Certain wildcats do not, namely, our Indian friends, the teepee builders. As a result, they build them, they start polluting, and the state industrial commission tries to take certain legal steps with very little legal background. Very few of them reach the court. When they do, it is usually tossed out because there is no legal basis to try the case.

This is supposed to be rectified, but this is one point, gentlemen, you can have a criteria where you submit it, but if you fail to give them the policing power, you might as well throw the thing out the window because anybody can come in, circumvent the law and then say, "All right, do something about it."

The cities do have codes. Milwaukee, I think, is the only one. The city codes are tight. The rest of the state, they smile and the legal people submit the plans and try to meet the code and the wildcats build them and then say, "Well, do something about it."

That, in substance, covers a part of the situation. I have had some experience with it.

MR. REID: I would like to call on Fred Kellow, since we have a new law. Fred is in the State Health Department of Michigan and had a hand in the regulations.

MR. KELLOW: We are going to have a lot of headaches. There is no question about it. There is a lot of promotion in Michigan. We have some 82 landfill operations going in the state with various methods of standards. We felt that our promotion and education had gone about as far as it could, and we are very much in favor of this licensing law.

I would imagine that we are going to spend a lot of time in court in the next five years, but I do think we have some backing now that we need, and we expect we will be eliminating all open dumps, there will be no more burning of refuse out in the open, and we hope we are going to eliminate the teepees.

Our licensing program will license hog feeders under a Michigan Act which requires the garbage to be cooked before it is fed to hogs. It leaves a lot to be desired because in agriculture's interpretation of garbage, this includes only material that has raw meat. I don't know how in the world they can interpret it this way, but this is what happened. We are going to license those that have raw meat and those that just take bakery wastes.

We still have about 300 of these in Michigan, and I hope these drop very fast in the next three months. I think it will, when they have to get under a licensing program.

We will be working very closely with our Air Pollution Control Board. In Michigan, we do have a new air pollution control bill which gives the division of occupational health more authority in this field. They have to develop a commission appointed by the governor. We don't know how far they will go, but again this will probably be started in about six months.

Our solid waste licensing bill has been given immediate effect at the present time, but we do not expect to implement them with the standard we are working on right now until about February 1. We have to get these passed through the regular procedures and it will take us about that long. I hope in a year I will be able to give you a little better picture of how we handle waste disposal in Michigan.

FROM THE FLOOR: We have a state law which gives the state health department authority which it badly needs.

A few years ago we got into discussion with a fellow and took him into court. The suit was dismissed because the court, in its wisdom, decided refuse and sewage were synonymous.

FROM THE FLOOR: I have two questions I would like to ask Mr. Overman. One is a prelude. We were successful at the last session of the legislature in getting a joint resolution passed and calling attention to the solid waste program and requesting a study be made by our department. Now, we are going to make this study. I want to know, one, can we get federal funds for this?

Two, can a statewide law be enacted, and if so, do you have any model to work from?

MR. OVERMAN: Well, I believe if this proposed legislation is enacted, there would be a possibility of getting assistance for that type of study. I think it is up to 50 per cent. This proposed legislation is very flexible and very broad and I am sure that the people who will administer it will have to formulate policies and regulations in that regard, but it would seem that making a study of the state's solid waste problem and recommendations, which I understand you are going to do, would be the type of thing that would warrant assistance or would be subject to assistance under some of these new legislations.

FROM THE FLOOR: Do you have a model law?

MR. OVERMAN: I don't believe they have one at present, but I am sure that that is something else that will be developed in this program when it gets underway. I am certain it has been done with other programs where legislation has been passed providing federal assistance, and I am sure that the public health service will provide some type of model legislation that can be passed.

MR. DOMAN (Macomb County, Michigan): I would like to comment on one comment that Fred Kellow made. Not too much has been said about the hog feeding situation. This something which we still have to consider. Prior to the passage of legislation the farm people lost a lot of their hogs because of disease, and I am told now that since the cooking process has been in effect that they are losing very few of their hogs because of disease, and, therefore, the economics of this relatively low cost food is making it a much greater incentive than ever before.

I have a feeling that in Michigan perhaps we will lose a lot of our hog feeding operations when our new law goes into effect, but I am expecting that some of the large ones will get larger.

MR. FLOOD: This is a continuation of what I said before. I went back to my room and got the publications that I spoke of, so I thought I would read out the exact description of them in case anybody wants to obtain them.

The National Academy of Science Publication No. 1280. It is titled, "Apartment house incinerators, flue fan."

It may be obtained from the printing and publishing office, the National Academy of Sciences, National Research Council, Washington, D.C., for a price of two dollars.

The other publication, "Our Criteria." Criteria used in the examination of applications for the installation of incinerators.

This is a recent date, May, 1965. I have six copies which I will give to anyone who wants them, as long as they are public officials, and public officials and others may obtain this from our office in New York, public officials for free and others at a price of 50 cents each.

MR. REID: Thank you, we will allow that commercial.

FROM THE FLOOR: I would like to make an additional brief observation relating to what Mr. Shields said. This really backs it up.

I have a few responsibilities other than the field of solid waste disposal and air pollution. We ran into decisions that placed the burden right down the line from start to finish on the regulatory agency. We have a law that sets up a control district. It is written into the law that we shall use conferences, conciliation, and persuasion.

Gentlemen, this is fine until you get to the point of no return and sometimes you have to have a big stick available fur use. If the present legal trend continues, we are not going to have the legal stick and we are going to be where Mr. Shields was in trying to enforce his prohibition here.

I don't know what the precise answer is, and when the change will come, but when you look back through history, when there is an action, there always is a reaction. They go back and forth like a pendulum. Today the trend is, I think, to more and more making the regulatory agency prove everything, bend over backwards, but in the case of the field we are talking about here, the victim is the public. It is not the state agency.

I mean, I can live with a decision if the court says a man can do this and get away with it, he can accept that and have no other choice, but the people are the ones who are going to suffer.

MR. REID: It is a tough problem.

FROM THE FLOOR: Mr. Coleman, I would like to ask a general question concerning the Ohio Municipal League. What has the League done or what can they do toward working with various agencies or communities on refuse disposal plans?

MR. COLEMAN: To be very frank with you, we haven't done very much in terms of setting up programs or assisting our local officials for the very good reason that we don't have the technical staff in this field. I am not sure that many of the municipal leagues do.

We do work in the legislative field in an effort to provide the necessary changes in our state law to provide the tools. We worked actively on House Bill 161 with the county officials, planning officials. It was a joint effort. We are constantly attempting to revise the finance limitations that are on local governments, both county and municipal, especially here because we feel this is an important part of our program.

One of the reasons why I advocate that the role of the state in this should be at least at a minimum in the field of technical help to our people at the local level, we feel that this is where we, as a league, can do the most good, trying to convince the state department of health and the Director of Finance of the state that budgetary provisions should be given to the state agencies which work with our local units of government for the provision of technical assistance.

This is my own personal feeling. I have never felt that this is the proper role of a municipal league to get into the technical advisory field. This is something that the working, operating agencies in my opinion should become involved in.

FROM THE FLOOR: I would first like to comment on something the gentlemen from Maryland said and that is: Allegheny County, which includes the city of Pittsburgh, got CFA funds for a refuse study. I think they got in the neighborhood of $45,000. I am not sure whether this is an answer to your question, but take it for what it is worth.

Another thing is that the Public Health Service does put out a model ordinance. It is designed for local municipalities. I can't see why some of the features of this ordinance couldn't be incorporated into a statewide law or regulation.

There is a question I would like to ask Mr. Overman. Senate Bill 306, I remember commenting on it. One of the comments we made was that the administration or the distribution of the fund be in the hands of a state agency.

We asked that the distribution be in the hands of the State Health Department. As I understand, this is not so up to this time.

MR. OVERMAN: In regard to your first question, as the bill is in its present state, the House version of it, reported out by the House committee, it doesn't provide that all funds that go inside a state will be handled by a state agency.

In regard to your second question, if it is passed, how can you best get it, I think the best way, quickest way you can get funds is write to the Congressman or the Senator for a copy of the House passed version of the bill.

FROM THE FLOOR: Wouldn't the money have to wait until the next appropriation bill? This just authorizes the appropriation of money, isn't that right?

MR. OVERMAN: Yes. Funds will have to be appropriated through some supplemental appropriation bill or some appropriation.

FROM THE FLOOR: I get the general impression that there is a lot of duplication around here. I wonder if it would be possible to set up some sort of permanent committee on solid waste to have a clearing house about what we have learned today, so I don't have to sit down and write my own notes.

MR. REID: Is that a pretty general feeling that it would be helpful to have a clearing house committee of some kind to disseminate information and means to all of us who are concerned about this? I am sure I would appreciate something of that kind in my area.

FROM THE FLOOR: I think it should go beyond the people that are represented here. I think we need more representation from city people, city officials, county officials, the Bar, the courts, and so forth. I think some other people have to be brought in from some of the other disciplines to see the entire picture which has been presented here.

MR. REID: Let this be a matter of record that there is some concern that there be a means of disseminating information, and that it be disseminated as widely as possible to people interested in the solid waste disposal.

I know Public Health Service has something along this line. Some of you may be aware of the fact that jointly, the American Institute of Planners and the State Sanitary Engineers' Association have a committee working on the role of urban planners and the role of the sanitary engineer in urban regions, at least to give us some guide line statements of what our responsibilities, singly, ought to be, and, collectively, ought to be in these situations.

A similar statement was worked out between the Institute of Traffic Engineers and the American Institute of Planning, so at least in some of the professional areas, this is getting worked on.

I appreciate the fact that the working areas, the city managers, the county commissioners, and so forth, needed to be brought into this picture as well.

FROM THE FLOOR: I think we have a member of APWA here. You have got the ground work set. Let's hear from him why we couldn't supplement it.

FROM THE FLOOR (Representative from APWA): We have 8000 members in the American Public Works Association. Most of these people are public works directors, city engineers, directors of sanitation, men who have the responsibility for the enforcement of these various laws and the specific ones regarding the collection and the disposal of solid waste.

We have a committee within the American Public Works Association known as the solid waste committee and, of course, we have put out publications on this matter.

We have a publication on collection and one on disposal of refuse. The one on collection is presently being revised. The third edition should be available in draft form within a month, and we would hope before too long to have it printed and ready for distribution.

We also have participated in a number of conferences of this type sponsoring and working on certain programs sponsored by the Public Health Service, and we try in general to be helpful. We are actually embarking at present on another program which I think will be very valuable in training those who have responsibility for solid waste.

I personally have worked on the training manual and I think that Dick Eldredge could talk more about that and probably will tomorrow. He is going to talk tomorrow about the educational efforts in the field of waste. I will not go into that.

I would like to make it very clear that as the Director of Research of the American Public Works Association, I am particularly interested in this field, not only in research phases of it, but also in the phases of education, disseminating information, compiling new and better information, and doing anything that would be helpful.

While I am on my feet, I would like to make another comment. I think it is very encouraging from what has been developing at this meeting to see that we are not only considering this one field of solid waste here, but, for instance, along with our considerations in this field, we are trying to consider some of the things that are connected with it such as control of air pollution. I think this is the sort of thing that is sometimes forgotten about at meetings of this type where we get into a general discussion and talk of our problems, but forget about other problems associated with it.

In this particular field we know that many of the people who have responsibility for solid waste disposal, the enforcement of the ordinances and the statutes regarding it, also have the responsibility for the control of air pollution. This was my case when I was Public Works Director of St. Louis County. I had both of these responsibilities. As such, I know that what can be done if certain action is taken and thought is not given to other problems that arise.

It is very encouraging to see that a lot of thought is being given to talk about incineration and the air pollution phases of it.

I would like to make it specific and give a little example. The state of Missouri this last session -- in fact, the governor just signed the bill -- now has a bill on air pollution. Prior to this time, there was no legislation for the control of air pollution except in certain municipalities like the city of St. Louis. Actually, St. Louis County did have an air pollution ordinance and provisions for enforcement. This was enforced partly by the Public Works Director, and certain phases of it by the health department.

I mentioned yesterday the county passed a five million dollar bond issue for the construction of an incinerator. If I was still Public Works Director, I would be bracing myself because in about a couple of years we will need two incinerators in operation. I know exactly what is going to be happening. We are going to be getting complaints from people that we are polluting the air, and we are out trying to control industry to keep them from polluting the air.

The real problem is to do a job of enforcement, to enforce this by the municipality. This is one of the reasons why the APWA has embarked on this research project, which we hope to complete during this year, to develop this monitoring device to measure the amount of particulate matter that is contained in the effluent from the stacks.

This will also be used to monitor the stacks of industrial concerns. I would hate to be the Public Works Director who would enforce this law if we don't control the effluent from the incinerators and have some means of control of quantitatively publishing the amount of effluent.

The APWA, I believe, provides the framework for the organization which was suggested by this gentleman here. We would be very willing to do that.

MR. REID: Thank you.

FROM THE FLOOR: While we are talking about things in general organizational circumstances, I would like to request the chairman to take a vote by show of hands whether the disposal of vehicles, automotive vehicles, motor cars, is properly a part of this operation as well as human waste disposal.

MR. REID: Without further debate, may we have a show of hands whether you consider the disposal of junk automobiles and motor vehicles a part of the solid waste disposal. Those in favor, raise your hands. Opposed? This was unanimous.

In the Detroit region, our voluntary research agency, not governmental, has already undertaken a project of how to dispose of junk cars in a metropolitan area. On the basis of that report, we hope to add it to our normal solid waste disposal report.

Let me add something here locally. This is just a seed so far in the Detroit region. We have developed sufficient interest in enough of the aspects of the environmental health and health in general to have a committee of our agency, the Regional Planning Commission, considering the possibility of setting up what we might call a Health and Environment Council.

This will be made up of sanitary engineers, public works people, medical people, planning people, and so on, which would serve as a broad council to organize a broad program in the area to attack all the facets of health, including environmental health, in relation to the physical, social, and economic environment. This is just in its incipient toe-tipping stage, but I have great hopes of this being the matrix of a metropolitan region that we can face all these problems together. The people we have talked to have been extremely interested and we are fortunate in having on our committee one of the members of the Federal Council on Intergovernmental Relations who has been pushing us along this line.

I don't know how long we are supposed to go. It is twenty minutes to twelve. Maybe we had better cut off while we are hot. I make this final admonition. Having faced the challenge of the problems of implementation, do not let us be like the little girl who stole her mother's girdle, but didn't have the guts to wear it. (Laughter)

FROM THE FLOOR: Speaking on behalf of a small health department with no large city whatsoever and relatively minor air pollution problems, compared with the heavily populated areas, what does the panel or the group see in regard to the possibility or sensibility of the formation of a land and air pollution board at the state level, because in most cases we have water pollution control boards at the state level, to handle this situation that Mr. Courtney brought up about the local public works representative having some bad air pollution problems when his own incinerators are violating the law.

MR. REID: Mr. Overman or Mr. Coleman, would you like to speak to that?

MR. OVERMAN: I believe some states already have that type of control as was mentioned over here earlier. I would presume it is quite in order if they are problems in the small areas and the local areas and would not be stacked up because of this being a small operation, that it would be appropriate for it to be handled by state administrative agencies.

FROM THE FLOOR: Is this a majority? Do most states have it or not?

MR. OVERMAN: I wouldn't know, but I wouldn't think that most states have it in this particular area because there hasn't been a lot of activity, as we mentioned earlier, in regard to solid waste control at the state level.

MR. COLEMAN: I would say from the standpoint of Ohio, looking ahead a few years, I would anticipate that the state of Ohio would be involved in a regulatory manner, perhaps not as strongly as in the water pollution control area, but I look for the state to be involved in air pollution and the control of particularly refuse disposal in some form.

When this will come about, I don't know, but I am anticipating that the state of Ohio will become involved in this at sometime in the future.

DR. HART: Along this line of this last discussion, I would like to introduce you to the fact of what California has been doing with regard to this waste program and problem, that last December our governor found $100,000 someplace and offered it up for grabs to the space industry, feeling that the space industry, both in financial doldrums, and also very capable in the area of systems analysis, could make a study of the total state waste management problem into the coming 25 or 40 years.

Arrow-Jet General did do this. They have completed their report. I have barely seen the summary of it. It is a nicely done brochure but not very informative. However, they point out that our state has a water resources administrator, a man who is concerned with water and its allocation and is also concerned with pollution. This waste management study suggested that there will be a waste czar in the future someday who will be concerned with how much of a pollution can be cranked into the atmosphere, into the water, or into the land to balance these resources for disposal in an equitable manner. Perhaps this is in line with what you are inferring and talking about this morning.

FROM THE FLOOR: It is my feeling that as you get more agencies created, you have more and more competition for the limited amount of tax dollars which the taxpayers, as you well know, never appreciate.

I think you also have another situation that can be created through the fact that if you have several different departments involved in control of the various facets, let's say of the environment, that oftentimes the cooperation is not what it should be.

I think actually what we are talking about here is part of the control of the environment which is the same as we are talking about in controlling air pollution and water pollution.

It seems to me that this is a job which could be done more economically by giving it to an existing agency which would have the responsibility in this field, and giving them sufficient additional resources to do a satisfactory job as far as solid waste disposal.

Water pollution, solid waste disposal, air pollution, or what-have-you. In many cases they are going their separate ways and may be all making the same types of mistakes.

FROM THE FLOOR: I would like to make a few comments on New York State's program which I think will point up another problem.

As developed, New York State is now embarked on an ambitious program taking the state, county by county, and setting up county-wide standards for best air use, very similar to the program that they have recently completed on their stream pollution program.

They have just got started on that. I believe they finished one county and I think they are working the second county now. We have run into the infancy of this program to design an incinerator. The enforcement is administered by the local health departments in this particular case, and the local county health department did not, at the time we got this to the design, have anyone trained in air pollution control procedures, or means of evaluating it.

These programs are fine. I think they are necessary. I think they are going to come. I think we are going to be faced with an immediate problem of finding quantity and quality with reference to training and personnel necessary to enforce these programs properly.

MR. REID: Thank you, an important point.

THURSDAY AFTERNOON SESSION

The Thursday afternoon session convened at one o'clock, Mr. Rosendahl presiding.

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MR. ROSENDAHL: You will note by the program that we now get a little deeper into the subjects that we were leading you into this morning, into the financial aspects of refuse programs with which many of you are very, very vitally concerned.

I have heard from the questions that all of you are concerned with where you are going to get the money. Our speaker this afternoon who will open this session received his Bachelor's Degree with honors from the Pennsylvania State University, major in political science. For the preparation and presentation of a thesis, "The Attitude of the 78th and 79th Congresses Toward the Participation of the United States in the United Nations."

Dr. James received his Master's Degree from Pennsylvania State and he earned his Doctorate from the University of Pittsburgh.

He has had wide experience in governmental affairs and has published numerous articles on such subjects as council manager plan, intergovernmental relations, procurement, municipal administration, and urban financial administration.

In addition, he has been responsible for developing training programs in the area of public works administration, fiscal planning and programming, procurement, tax administration, and municipal administration. He is widely sought by local governments in problems relating to these subjects.

Like most men of his stature, he is active in many, many professional organizations.

Without further ado, I would like to present to you Dr. Joseph A. James, Director of the Institute of Local Government, Graduate School of Public and International Affairs, University of Pittsburgh.

FINANCIAL ASPECTS OF REFUSE PROGRAMS

By: Joseph A. James, Director
Institute of Local Government
Graduate School of Public and
International Affairs
University of Pittsburgh

The financial or revenue aspect of refuse programs is only one part of a most important governmental process known as fiscal planning. The second element of this process is expenditure planning or programming. The latter is concerned with the development, execution and appraisal of a governmental operation, such as solid waste collection and disposal operations. The former is concerned with the means or money to finance this and other government operations.

Revenue and expenditure planning and programming for refuse activities have several common characteristics. The first is that these processes have a direct effect or impact upon other municipal programs. Unfortunately, not too many public officials are aware of this interrelationship. As a result, various municipal programs may be contradictory or their effective implementation lessened by the impact of other activities.

A second common characteristic is that revenue and expenditure planning and programming are continuous operations. They are not undertakings to be engaged in on a periodic basis. To be truly effective, the two parts of fiscal planning are continuous operations requiring the day-to-day attention of responsible officials.

Another characteristic is that these two parts of this important process must be communicated. They must be communicated not only internally in the governmental hierarchy, but externally to the various publics and other jurisdictions concerned with a governmental program, such as solid waste collection and disposal.

The fourth characteristic is the all important one of law. Our numerous cities, towns, villages and townships are not sovereign legal entities. They are infra-sovereign units. They possess no inherent power. Any power which local units may exercise must be delegated to them by a higher governmental jurisdiction (namely the state) or implied from such a grant of authority. This concept of infra-sovereignty probably was best expressed by Judge Dillon in 1868 when he wrote in a judicial opinion:

> "Municipal corporations owe their origin to, and derive their rights wholly from, the Legislature. It breathes into them the breath of life, without which they cannot exist. As it creates so may it destroy. If it may destroy, it may abridge, and control. Unless there is some constitutional limitation, the Legislature might, by a single act, if we can suppose it capable of so great a folly and so great a wrong, sweep from existence all of the municipal corporations of the state, and the corporation could not prevent it." [1]

The significance of Dillon's Rule for our purposes is that a local jurisdiction has no taxing or revenue raising authority unless someone can point to or find a grant of power permitting the jurisdiction to impose this or that type of revenue levy. Therefore, the first consideration in any discussion of finance is: Does the jurisdiction have the authority to raise the required revenue by the imposition of a certain tax or service charge?

In addition to determining the legal basis for any action in the area of revenue, there are other considerations which should be of concern to those responsible for developing and executing local tax and service charge programs. The questions of what is an equitable tax or charge, and what is a "good" revenue source or a "fair" one have plagued man since government became a recognized institution in society. There are numerous criteria which one may apply in answering these questions; probably the one determining factor is one's value system. But there are numerous guides. Of these, three have some bearing upon our discussion. The first criterion is one of administration. Involved are such matters as collection and enforcement procedures and costs. In other words, can the levy or charge be administered equitably and fairly at a minimum cost. In reviewing the multiplicity of taxes imposed by jurisdictions in my State, one wonders whether this criterion was ever considered by the public officials responsible for the revenue programs. For example, it is my opinion that the local income tax - so prevalent in Pennsylvania's numerous boroughs, townships and school districts - is one revenue source which should not be utilized by these jurisdictions. The imposition of this type of tax runs counter to my understanding of the administrative criterion. And, I think any indepth study on the administration of the local income tax in Pennsylvania would substantiate this opinion, particularly if the study dealt with the verification and enforcement aspects of the income tax.

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[1] City of Clinton vs. Cedar Rapids and Missouri Railroad Company--- 24 Iowa 455 (1868).

The second criterion is concerned with yield. Simply stated, this criterion refers to the amount of money which will be raised by the levy or charge. Will it be adequate to meet the needs of a particular service program which is to be supported - in whole or in part - by the tax or charge. This particular criterion presents no real problem; however, an administrator might encounter some forecasting difficulties if the jurisdiction is imposing the levy for the first time or has had limited experience with the tax or service charge.

A third criterion involves the concepts of equity. Basically the problem confronting a jurisdiction is whether to impose a tax or charge which is based on the concept of ability-to-pay or the concept of benefits received. The former concept implies that those citizens who have the fiscal ability should assume a greater share of the fiscal burden than those citizens of a community who have less in the way of financial resources. If the benefit concept were applied, the citizen who obtains the service, such as solid waste collection and disposal, would pay in accordance with the type and extent of service received. The application of the benefit concept in a local revenue plan resembles the price mechanism for services which one finds in the private sector of our economy and in many of the proprietary functions of government.

In addition to these concepts of equity - vertical equity - there is the concept of horizontal equity. Here we are concerned with treating those in a similar fiscal position equally or near equally as possible. This concept of equity at times is difficult to implement in the administration of various types of taxes, such as the real property levy where there are problems of assessing like properties at the same valuation rate.

Our brief discussion of equity indicates that value judgments must be made concerning the final incidence of the various revenue sources. It is suggested that the application of the ability to pay concept is most acceptable where the expenditures from the levy or charge result in benefits of a general nature to the public at large. The other concepts of equity - the benefit principle - probably is most acceptable where the benefits received from the governmental service are direct and measurable and where the clientele served has the resources to pay for the service. It is assumed that the recipient of the service pays a fee or charge commensurate with the value of the program furnished by a governmental unit.

Revenue programs of our cities, towns, villages and townships have several common characteristics. Generally, these programs are not based upon an ability to pay concept. In most instances, the taxes or levies imposed are regressive in nature or at best proportional.

Probably one reason for the regressive nature of local fiscal programs is that the jurisdictions normally do not possess the legal authority to adopt other types of revenue measures. Another characteristic is that most revenue measures, particularly taxes, either exclude or exempt certain classes of taxpayers or properties from the levy. I know of no local tax law in Pennsylvania, for example, which does not provide for certain exemptions or exclusions. These exemptions or exclusions either are contained in the enabling legislation authorizing the levy or result from the administration of the tax. Aside from the theoretical problems of equity which arise from such exclusions or exemptions, a very practical problem results: the local tax base is reduced or erroded and additional revenue sources - not always readily available - must be found if the jurisdiction is to provide a needed governmental service in accordance with any generally accepted service standard. The seriousness of this problem can be illustrated best by referring to my home City of Pittsburgh where about 30 per cent of the assessed value of real estate in the City is exempted from the real estate tax. And, it appears that the situation will get worse because of the changing economic base of the City and because the state legislative body is quite susceptible to granting additional exemptions or exclusions without any apparent realization of the impact such action may have upon a jurisdiction's fiscal position.

A third common characteristic of local revenue programs is the fear - real or imaginary - of citizen resistance to any new revenue measure or rate increases of existing levies. It is a fact of life that our urban citizens are demanding more and more services - both in terms of quality and quantity - from our local governmental units. It is a moot question whether there is a general taxpayer resistance to local rate increases or new tax levies. But many public officials, particularly those whom I know, believe there is resistance of this type. As a result, they are extremely cautious in developing new services or expanding existing ones if changes are necessary in the revenue structure. Possibly one reason for this fear or problem is the inability of government to communicate properly with its constituents and a failure or lack of understanding on the part of the citizen demanding the increased service.

Another common characteristic of local revenue systems is that more and more jurisdictions are relying upon service fees and charges to finance local expenditure programs. This tendency is to be found particularly in our larger cities. Reasons for this changing nature of the local revenue structure are numerous. Some of the more important considerations are the inability (real or imaginary) of the property tax to keep abreast with governments' needs; unrealistic tax rate limitations; absence of broad, general non-property taxing authority; a desire on the part of the public official to change the nature of a jurisdiction's revenue system; and a real need for additional moneys to finance required programs.

Many local revenue programs also are changing in another direction. More and more jurisdictions are developing heterogeneous tax structures. Traditionally, the property tax (especially upon real estate) has been the backbone of local fiscal programs. But since World War II when many jurisdictions were granted broader taxing authority, the real property tax is becoming less important as a source of revenue to many of our urban areas. Again, my City of Pittsburgh is an example of what is taking place in the way of a heterogeneous local tax program. Today, Pittsburgh imposes seven non-property taxes in addition to its imposition on real estate. These non-property levies which include taxes on earned income and net profits, privilege of parking, privilege of working, admissions to places of amusement, personal property, privilege of transferring real property and income from mercantile operations account for about 40 per cent of the estimated tax moneys projected for the City's 1965 general fund budget. Similar comments, although not as significant, could be made for other political jurisdictions in the Commonwealth. The reasons for the development or existence of heterogeneous local tax programs are many. But generally they result from a broadening of the local tax base, need for additional revenues to finance new or existing service programs, changing economic conditions and inflexible nature of the real property tax.

No doubt there are other common characteristics which could be mentioned but those which I have discussed briefly will suffice for our purposes.

Before discussing the several means for financing solid waste collection and disposal operations, I would like to mention one element relating to this service program which I think is interesting and somewhat troublesome in the year 1965. This element relates to the question of whether this particular service is actually a governmental operation or whether it is one which should be vested in the private sector with little, if any, concern on the part of government as to the effectiveness of the operation. If a study the Institute conducted several years ago of solid waste programs in various Western Pennsylvania communities is valid, one finds that in the smaller jurisdictions, the public policy-making officials believe that solid waste operations are functions which should be the responsibility of the private sector.[2] Although there are exceptions, the smaller municipalities surveyed generally tend to leave the problems of refuse collection and disposal to private collectors or to the individual home-owners themselves and most of the moneys for collection expenses are provided through fees assessed by private collectors.

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[2] Institute of Local Government, University of Pittsburgh. Refuse Collection and Disposal Programs in Western Pennsylvania Political Subdivisions---A Survey. 1960.

The private collectors operating in political subdivisions who have not established formalized collection programs (either by municipal contract or by force account) for any or all of their taxpayers or property owners, normally have no restrictions imposed on the operations by the local jurisdictions. Only a limited number of the communities require that private collectors obtain licenses. Even fewer have adopted any regulations limiting private collectors to certain work routes or areas or to the amount they may assess the recipients of their services.

As the sizes and populations of the surveyed municipalities increased, the situation changed considerably. These larger jurisdictions entered into the administration and financing of these operations. For all intents and purposes, solid waste collection and disposal is considered a governmental function in these local units. One hopes that the smaller political subdivisions will adopt a similar philosophy as they become more populated and urbanized.

Two basic means have been developed to finance solid waste operations: general taxation and user charges. The former method is the most popular; however, the use of fees or charges is not too uncommon. And some communities make use of both methods. Fees are assessed for services rendered in excess of the normal program standard or are imposed against certain types of users, such as commercial or industrial establishments. Other sources of revenue which are being utilized are the licensing of private collectors, storage can rentals and special assessments.

Rarely is a specific tax levied for the purpose of financing refuse programs. Moneys for such purposes normally are appropriated from a jurisdiction's general fund. The bulk of revenues for this fund may come from a variety of tax levies or from a single tax source.

Local governments - or any government for that matter - have five sources which they may use, if permitted by law, to obtain tax moneys to finance their activities. These sources of revenue are: consumption, property, income, privilege and the individual.

Although it is declining in importance as a resource of revenue in some political jurisdictions, the levy on real property is still the backbone of local tax programs.

The administration of the real property tax - or any tax for that matter - involves three basic steps: assessment, collection and enforcement. Many problems are involved in the execution of each of these steps; however, time does not permit a discussion of all of them. One acute problem, however, is in property assessment. This particular function requires a skill requiring considerable knowledge of land and improvements and their values. Therefore, real property assessment cannot - or should not - be left in the hands of the incompetent or inexperienced. Nor is assessing a function which can be exercised by all jurisdictions, particularly those which do not have the resources to support professional staffs and acceptable appraisal systems. The refusal - or inability - of many political jurisdictions to recognize these obvious facts of life is a problem which seriously affects local governments' ability to finance required programs. Other problems associated with real property assessment involve equalization and debasement. Debasement is the practice of assessing properties at less than their market values. There are some legal implications involved in this practice. But equally important is the fact that it may affect adversely a jurisdiction's fiscal capacity. The city, town, village or township may have the tax base to support required programs; however, it may not be able to raise the necessary funds because of debased assessments. Debased assessments also may have a negative effect on a jurisdiction's borrowing capacity, in those instances where it is related to the assessed value of real property.

Equalization implies the application of the same ratio of actual value to various assessed properties. This is a difficult and complex process in our urban communities because of a multitude of factors, but the more the concept or practice of equalization is ignored, the greater the discrepancies which will appear in the tax system.

As I indicated earlier in my remarks, exemptions from the real property tax may - and often do - place limitations upon a political subdivision's ability to provide needed programs. It is not my purpose to justify exemptions or generally to criticize the concept. It is a part of our tax life. But it does create some difficulties. Not only may the tax base be eroded, but an excessive amount of tax exempt property may be located in a single jurisdiction, particularly one which functions as governmental, hospital, educational, or similar service centers. Likewise, one might question the subsidy - which an exemption represents - of various activities enjoying this special status. Yet, another concern relates to the class of property to be exempt. The problem of distinguishing between property, or part thereof, devoted to a public use (and hence exempt) or to a private use (and hence non-exempt) is a complex one which has confused even our most learned tax experts.

Another problem, or constraint, is that in many areas public officials must develop real estate tax programs within certain rate limitations set forth in statutes or constitutions. Real estate tax rate limitations are the product of the Great Depression and indicate - to me at least - a public mistrust of local policy makers. The objectives of tax rate limitation laws are many: effect a reduction in public expenditures, prevent the real estate tax rate from becoming too burdensome, encourage more realistic property assessments and facilitate governmental reform. Whether these and other alleged objectives have been realized is not our concern. What is of concern is that they represent one more road block which many public policy makers must hurdle in developing revenue programs to pay for our many and varied urban needs. Of course, the seriousness of this problem is dependent upon the nature and type of rate limitations in effect in the jurisdiction.

The administration of other types of taxes frequently found in many of our local governments involves the same three basic steps mentioned earlier. But, the assessment process for many of these other forms of taxation differs from that associated with the real property levy. In the latter tax, the government places a value upon the subject. If other taxes are imposed - such as a tax on earned income - the subject tells the government what he earned and the extent of his tax liability. The process of self-assessment is also utilized in many other types of local non-property taxes. Inasmuch as the self-assessing concept is employed, problems relating to under-or-over-reporting of tax liability become rather common. Verification and auditing of tax returns and records must, therefore, become an integral part of the administrative process in the collection and enforcement of such levies; become an integral part, that is, if the governmental unit is concerned with equity, compliance, and the amount of revenue to be gained from the levy. Admittedly, there are numerous political and administrative problems involving verification and auditing procedures, but unless the responsible officials take the proper steps to ensure compliance, I question whether a self-assessing levy should be made a part of the local revenue system. Unfortunately, not too many of these officials or their jurisdictions (at least in Pennsylvania) have instituted such verification and auditing procedures. The problem becomes more acute in those municipalities which must function as their own tax collectors and which cannot benefit from having their taxes collected by an employer or sales clerk.

Tax exemptions, exclusions, and rate limitations also exist in the area of non-property taxes. The problems created by these special features are similar to those in the real property tax area. But because of some of the complexities involved, I would like to discuss, briefly, the exclusion feature as it is applicable to the

Pennsylvania local earned income tax. Just one example will suffice. By law, income earned from manufacturing is not subject to the tax. This one exclusion appears to present no particular problem. In fact, the matter is quite simple: income from manufacturing cannot be taxed. Unfortunately, the matter is not quite so simple because of the basic difficulty of defining manufacturing. Just what is manufacturing? Aside from the definition problem, there is the problem of developing and implementing administrative regulations and procedures relative to this particular exclusion. Similar difficulties arise from other excluded income, such as that obtained from rental properties or that earned in other jurisdictions.

Although municipal solid waste disposal operations generally are financed from general tax revenues, many jurisdictions are relying upon charges or fees to finance - in whole or in part - this particular service. One reason for this reliance upon special charges is that adequate and sufficient revenues may not be available to finance refuse operations in accordance with acceptable performance standards. When solid waste disposal operations are financed from general tax revenues, these activities must compete with municipal services equally important to our urban way of life. In this "yearly battle" for limited tax resources, refuse operations often come out second best. As a result, the activity may be something less than desirable. Therefore, one way to increase the quality and quantity of a service is to rely upon another revenue source, namely fees or charges.

Although fees and charges may be means to obtain needed revenues, the utilization of these financial measures does present at least one philosophical problem. Is refuse collection and disposal an activity primarily performed by the municipality to protect the general health and welfare of the community's citizens or is a solid waste operation to be considered as a utility and provided as a marketable service that a citizen may purchase in the degree that he desires it? Basically, the problem is whether the service confers a benefit on all members of the community or a special benefit just to the users of the service.

Realities of modern fiscal life probably make this problem academic. The pressing need for funds to finance services often mandates alternative courses of action which many persons may consider less desirable than other means. Although one must be practical in local fiscal matters and be willing to accept something less than desirable, consideration to this basic philosophical problem merits attention from those officials who are responsible for suggesting revenue measures. Such consideration is believed important because the effectiveness of a program is dependent largely upon its use, and the imposition of a system of fees and charges may discourage or limit the use of the solid waste facilities. Consideration or an awareness on the part of public officials of this basic philosophical problem also should permit the development of a fee schedule which accounts for varying fiscal resources among the clientele benefiting from the service.

It may be possible for example to have a schedule of fees which is not fixed, but which is varied depending upon such factors as: the service provided, areas served or a citizen's ability to pay. Another element which should be of concern to those who have the task of preparing fee schedules is the determination of whether the amount of money to be raised by these special charges should be sufficient to pay the actual or estimated cost of providing the service (or a particular part of it) or whether the service should be subsidized. If the latter policy is accepted, part or all of the capital costs and possibly a portion of the operating expenditures will be financed from general taxes. The more a policy of self financing is adhered to, the greater the administrative burden and the probability of greater costs.

The development of fee schedules for projects which are to be self financing require the establishment, maintenance, and utilization of cost accounting procedures and techniques. Unless this fiscal tool is utilized, it would be difficult - if not impossible - to have a fee schedule which would truly support a self financing project or activity.

Another area of difficulty is agreeing upon a unit of measurement which could be used in the fee schedule and which reflects the cost of the service. Involved are such matters as quantity and quality of service and the benefits derived. A number of measurable units have been and are being used in fee schedules. For example, the following units are used by jurisdictions with which I have worked: number and/or size of containers, type of structure or property served, collection frequency and class of refuse collectedfor disposal.

Other elements of concern in the use of fees and charges which are often overlooked, but which I deem most important, are procedures to facilitate the periodic review of the fee schedule and the adoption of a means for the impartial administrative adjudication of disputes between the recipient of the service and the provider of the service. I suggest the latter because I feel strongly that every possible measure should be taken to protect the interests - or rights if you will - of the citizen. The periodic review procedure is recommended because changing socio-economic conditions appear to mandate a continuous justification of the fee schedule and an analysis of its impact and administrative costs.

The administrative process as it relates to fees and service charges is similar - in many respects - to that found in the administration of taxes. Similarly, many of the same difficulties associated with local taxes arise when fees and charges are employed.

Enforcement of fee payments, however, presents at least one interesting difficulty not encountered generally in the enforcement of tax payments. The difficulty is quite simple to state, but its resolution can be, and has been, troublesome to many administrators. The problem is this: What will be a municipality's policy when one of its customers or service recipients refuses to pay the assessment? Should the service be discontinued? If so, what are the public health implications of such a move? Admittedly there are other ways to cope with this problem (e. g. advance payments, discount payments and property liens); the important concern is that the responsible official be aware of this problem and adopt ways to cope with it which will not affect adversely other municipal programs.

Municipal indebtedness - or the use of bonded funds to finance refuse activities will constitute the last part of our discussion. General public corporations normally are restricted in their abilities to borrow funds for capital expenditure programs. These restrictions are basically negative in character and result from a period in our history when municipal governments managed their affairs at relatively low levels of performance.

Limitations on municipal borrowing take several forms. The more common are the referendum requirements, types of bonds to be issued, procedures to be followed in issuing bonds, limitations on interest rates and maturity schedules and restrictions as to the amount of money which may be borrowed. This last limitation in many communities is expressed or fixed as a percentage of the assessed value of taxable real property.

I do not intend to discuss the matter of whether these limitations on borrowing have restricted a governmental unit's ability to provide needed capital facilities. Admittedly, a low real estate assessment may affect borrowing capacity, but are not jurisdictions generally in a position to do something about the low assessment?

Secondly, complaints about lack of borrowing capacity may be more imagined than real. A recent study of Allegheny County communities, for example, indicates that most of them have more than adequate borrowing capacities to finance their foreseeable capital needs. The problem is more political than legal. The policy makers in these jurisdictions - for reasons best known to them - prefer not to commit their authorized borrowing capacities. They prefer on the other hand, to create special purpose corporations to build, construct and operate needed capital facilities. As a result, the projects generally are more costly and government in the County is further balkanized. Instead of less units there are more.

Possibly one of the most important considerations in a municipal indebtedness program is the debating and resolution of various policy issues and the adoption of an indebtedness program reflecting agreement on these issues.

The policy issues are many and varied, but the following is a partial list:

--amount of borrowing capacity to be kept in reserve for emergency purposes.
--extent to which revenue producing projects should be self-supporting.
--types of facilities to be financed from councilmanic or electorate bonds.
--kinds of capital projects or facilities to be financed from current moneys.
--use to be made of reserve, revolving or depreciation funds.
--type of bonds to be issued and length of maturity schedules for various projects.

There are other policy issues but the six I have mentioned will suffice to illustrate the problems involved. I suggest consideration of these policy issues because fiscal planning in any acceptable sense is not possible unless agreements are reached on these fundamental issues.

In addition to proposing the resolution of basic policy issues, I suggest that an indebtedness program should be part of a comprehensive development plan: A development plan which reflects all capital needs believed necessary at any given time. Admittedly, there are difficulties connected with the preparation of comprehensive development plans. But in spite of the difficulties, I propose the concept or process because it is the only means I know which will give our policy makers an idea of what their jurisdiction's needs are and how these needs can be financed with the resources available. Without a comprehensive development plan, communities are in the "dark" as to needs, priorities, and resources. Also how the resources may be applied to meet community requirements.

May I in closing gaze into my special crystal ball and predict some trends or make some forecasts. Because of the cloudy nature of the weather when I looked into my special crystal ball, I will limit my forecast to three.

1. There will be increased use of grants to finance municipal activities. Program grants will be increased but I also think we will initiate, on a wider scale, the concept of block grants. This form of grant-in-aid is not earmarked for any specific purpose. The only requirement is the funds be used for public purposes.

2. The concept of a public purpose will continue to expand as we intensify our assaults upon urban problems.

3. Many services or programs traditionally believed to fall within the purview of local government will be transferred to existing higher governmental jurisdictions or to new ones not yet created or even dreamed of. This transfer will not be done without the traditional blood and thunder fight, but the problems of limited resources, the nature of certain programs, the increasing fiscal dependency of local units on other government authorities are just a few of the elements which make such transfers appear inevitable.

Let me close by quoting Oliver Wendell Holmes, one of America's greatest students of jurisprudence:

> "Taxation is the price we pay for civilization."

MR. CRANE: Our next subject this afternoon, the Political Aspects of Refuse Programs. We have with us John Witherspoon, the Associate Director for Research, National Association of Counties.

Mr. Witherspoon has his Bachelor's Degree in government and politics from the University of Maryland, has done post graduate study at George Washington University, is now a candidate for his Doctorate in government and politics, University of Maryland.

His previous professional experience includes a job as a research assistant, Bureau of Government Research, University of Maryland, municipal management investigator for the Municipal-Technical Advisory Service, University of Maryland, has also served as a personnel consultant in three different county boards of commissioners in Maryland, also a special assistant to the National Association of Counties before taking over his present position.

He has a long and extensive list of publications which I won't cover. They are quite adequate on the subject to which he will speak.

With this, I give you Mr. Witherspoon.

POLITICAL ASPECTS OF SOLID WASTES

By: John Witherspoon
Associate Director for Research
National Association of Counties
Washington, D.C.

I am honored to speak before this gathering on the Politics of Solid Waste Disposal. After observing the proceedings of this institute over the past few days and discovering the high professional level at which it is being conducted, I am especially grateful to be able to devote my attention to politics -- a field in which under the present circumstances I feel a bit more confident. Let me hasten to add that once having attended this institute, I will be able to pose as an expert in solid waste disposal -- before a gathering of politicians.

As you might expect from a representative of the National Association of Counties, today's view of the politics of Solid Waste Disposal will be from the local level. This is entirely appropriate. Solid Waste Disposal is essentially a local issue. Of course, it is a problem of national concern and we have placed the federal government in its usual role of providing financial incentives and receiving faint praise for it. It is also true in areas of many states the only law with respect to the health aspects of solid waste disposal is state law.

Nonetheless, the problem is a local one -- for it is only through local action that solid wastes are disposed.

Solid waste disposal is an important local political problem. The one factor that makes this so is population -- its growth and its concentration. Urbanization - a word that, if used before a public group twenty years ago, would need definition - is having dramatic ramifications on the whole structure of local government. Traditional relationships between city and county government, for instance, have all but vanished in urban areas. Many large cities are trying to hand over to their counties municipal services they feel benefit all residents of the county. Waste disposal ranks high on this list.

The very existence of the National Association of Counties with eleven full-time professional staff members is in itself a sign of the change which is taking place in local government. Nine years ago there would have been no one from the Association staff to be here today - we didn't have a staff until 1958 when Bernard F. Hillenbrand, the present Executive Director, came over from the American Municipal Association to head a fledgling staff that began and ended with himself.

Today NACO - as we are known in the alphabet world of Washington - is engaged in several projects that by their nature underscore the changes population pressures are bringing to county government. We are at the three-quarter mark in a Local Official's Community Action Program in water pollution control. We are beginning the same kind of program in air pollution control and have completed a draft of a similar program in planning and zoning. And - starting with this meeting - we have launched a consideration of solid waste disposal as the subject of our next Community Action Program.

The reason for these programs is simple. Our members need them. They are increasingly faced with issues involving demands for local expenditures to solve a growing host of problems in these subject areas. They have charged us with taking each of these problem areas, analyzing the factors relevant to county government, translating technical considerations into generally comprehendable terminology and developing guidelines that will enable elected officials to reach sound decisions.

Before leaving the point why solid waste disposal is an important local political issue I should also add that the future portends it even greater importance. An indication of this is afforded in Municipal Refuse Collection and Disposal, one of many excellent publications of the Office for Local Government, State of New York. There is a five-color chart in this booklet which depicts population increases in New York state for every decade since 1900. Included also is a projection for the current decade. The chart clearly shows that while the growth of New York state in the first forty years of this Century was almost entirely in New York City and other large cities, these municipal incorporations have practically stopped growing. In fact, New York City itself is losing population - and this in an era when population control is becoming a political issue. On the other hand, New York State will increase by some 2.5 million people in this decade. 96% of that increase will be in unincorporated areas.

What is happening in New York is going on in varying degrees in all fifty states. A general political implication of this growth is that the local jurisdictions which in the past have had the least to do with municipal type services will have to provide them on a large scale and with the high initial costs of capital expenditure.

A specific political implication of this population phenomenon with respect to solid waste disposal is that cities and urban counties with traditional means of disposal in someone else's territory will have to seek other means. Hopefully, a spirit of interjurisdictional cooperation will prevail and there are encouraging signs in this regard. Yet, as you well know, there are practical limitations of space on our chief means of disposal, sanitary land fill.

The politics of waste disposal may be best examined by understanding political factors of local government. For purposes of this discussion three local political factors stand out: politicians themselves, characteristics of local government and citizen response to local political issues.

Politicians are no harder to understand than are people, which is a backhanded way to admit this is a difficult subject. The most difficult thing about politicians is finding one. Especially at the local level of government there is a great reluctance to identify oneself as a politician. In truth everyone who has ever sought public office has been a politician even if only for a short time. The undesirability of admitting to being a politician is a national characteristic that is akin to another characteristic of American politics, running for public office while pretending not to and not want it. Remember the statement attributed to General Sherman, "If nominated I will not run, if elected I will not serve." This more than his march through Georgia almost destined Sherman to become our 19th president.

With respect to local politicians we can recognize three general types:

1. The single-minded office holder
2. The non-leader
3. The performer

Single-minded office holders are quite often the most dangerous of the three. They run for office for one purpose with a sort of devil-may-care attitude toward other issues and their re-election. In short they will largely ignore all issues except their one interest, which, incidentally can be either positive or negative and they don't intend being around when the results of their singlemindedness become clear. Often politicians of this type catch-the-bug so to speak and become politicians of the performer-type. Usually single-minded politicians are too strong-willed to become non-leaders.

We commonly refer to office holders as political leaders but there is a vast difference between leading and being pushed. The non-leader type of politician needs pushing. Usually he is very interested in retaining his office or moving on to another one but keenly aware that it is much easier to go along with the voter than it is to change the voter's direction. Unlike the single-minded type the non-leader is actively interested in a wide range of issues. His interest in solid waste disposal like all of his interests is conditioned to visible proof of which way voters are going. If he can be convinced that a particular course of action is popular his support is guaranteed.

I've deliberately used the ambiguous word performer to describe the third type of local politician. A performer is one who is doing his job, in this case being a true political leader. His motive is immaterial. It may be for his own political future as well as for more noble public purpose. In any event this is the type of politician who will not only lead a cause but will also take one to the public. If you can show the performer-type a feasible way of providing disposal, for instance, he will work to see its establishment with or without initial public support.

Turning to the characteristics of local government let us consider authority, structure and age. Authority and structure to a very large extent are determined by state constitutional law. Unfortunately, laws now in force are antiquated especially with reference to county government. Most local government laws were designed to prevent concentration of political power and today stand in the way of political responsibility and the provision of needed public services. The situation varies from state-to-state; however, it means that in any given community the technically ideal method of providing solid waste disposal may be impossible because of such things as lack of specific authority, limitations on tax rates and indebtedness and inadequacies in administrative structure.

The aging process in county and most city government is unusual - unusual because they are now old and yet still have to go through adolescence before reaching maturity. County government, for example, hasn't basically changed in a few states since colonial days. In these counties business is as usual in the courthouse and no one is looking to change things. In actual numbers many counties have little need of changing.

But in the five hundred or so counties affected by urban growth changes are taking place at an extremely fast rate. These are counties that either have gone through or are going through their second childhood.

The problems of waste disposal in these jurisdictions have stabilized around issues of improvement in mature jurisdictions and are chaotic in adolescent jurisdictions. This is further complicated by the fact that, while politicians in mature jurisdictions are usually either of the performer or non-leader type, people who seek to satisfy public needs with either greater or lesser enthusiasm, political figures in adolescent jurisdictions tend to be of all three types. Adolescent jurisdictions are also affected by a high incidence of turnover at the polls. Quite often a pattern develops whereby a jurisdiction changes from non-leaders, to performers and then to single minded office holders whose single mindedness is in cutting taxes. Many a soundly begun refuse program has floundered for this reason.

The key to successful local government lies in carefully maintaining good citizen response to public issues. We devoted a lot of effort in the early history of this country in designing laws to prevent bad government. In so doing we erected barriers to good local government. All the time what we should have been doing is developing the means by which citizens are kept adequately informed on public issues and public institutions.

But we haven't - so we must do it now on a piecemeal basis. We have to find means of making the citizen understand in spite of all the other demands upon his attention. The first thing we must do in seeking citizen understanding of solid waste disposal problems is to stop using that phrase. No this isn't professional heresy; it is simply practical politics. Show me a politician who talks of solid waste disposal and wastewater treatment before a group of average citizens and I'll show you an audience that thinks he has discussed only one subject. People understand sewerage, garbage and trash but terms like wastewater treatment, solid waste disposal and environmental health somehow miss the mark. Try them out on your neighbors as I have and you'll become as disenchanted with these terms as most politicians have.

Garbage and trash are strong words and are usually considered by citizens in two ways. First, they want collections frequently and regularly and, second, they want disposal to be out of the range of their senses. These are reactions so strongly held that even a suggested violation of them can get an angry crowd down to the courthouse faster than a promise to cut taxes.

What we must do is to guide this interest into useful and constructive channels. A good start is to interest groups such as the League of Women Voters and other service organizations interested in the problem of solid waste disposal. Once convinced of the magnitude of the problem they will begin consuming all of the relevant material available and translating it into a form that voters can easily comprehend. The interest of local political officialdom will also heighten considerably when they learn of this new interest of the local League.

The proper means of being successful in the Politics of Solid Waste Disposal has many facets which exist in varying degrees in different communities. Obviously all of these facets cannot be discussed at this time. They can be summarized I think by repeating a statement made to me recently by Alan Kiepper, Manager of Fulton County, Georgia. "Successful public programs are achieved by the professional in any field only when he tempers sound technical judgment with common sense. The best disposal site technically may be the poorest politically. Good sense might well dictate settling for the second or even third best site." All of us have a little of the Moses-complex in us. Robert Moses, as you are quite aware, has achieved much success, for good or bad, by figuratively spitting-in-the-eye of politicians and politics. But I would conclude by reminding you, if you'll pardon a slightly mixed metaphor, for every Moses in the ranks of professional public servants there are thousands of martyrs who will never reach sainthood.

THE ROLE OF THE CITIZEN

MR. ROSENDAHL: I have the distinct pleasure of introducing a most charming person and the only one during this whole week of conference from the opposite sex. Our next speaker will deal with the Role of the Citizen. She is very well qualified on this subject. Mrs. Rosenblum, a native of New York City, received a Bachelor of Arts Degree from Wellesley College and furthered her work in education at graduate school at Columbia University and the University of Maryland. She first became a member of the League of Women Voters in Montgomery County, Maryland, and nine years later became a member of the District League where she became chairman of two program committees, education and water resources. Later she became president of the District League and after the end of the two-year term was named to the National League Board.

In her present capacity, she has appeared before Senate committees as well as House committees, presenting the position of the League of Women Voters and she acts as the League's spokesman, speaking on water resources, planning and control.

Recently, she has been faculty member at training sessions on urban planning for environmental health, sponsored by the Public Health Service. It is a well known and established fact the officials of the League of Women Voters and members must wear many portfolio hats and never be at a loss on a question of importance. I ask you who is better qualified, then, to talk on the subject of the role of the citizen in the solid waste program than our speaker, Mrs. Rosenblum, Director of the League of Women Voters of the United States.

THE ROLE OF THE CITIZEN

By: Mrs. Haskell Rosenblum, Director
League of Women Voters of the U.S.
Washington, D.C.

The participants in this conference have my greatest respect. I can remember the days when there were no city planners and when the job of the county health officer consisted mainly of reporting communicable diseases, checking schools for epidemics of childhood illnesses, and posting red quarantine signs on houses where there was a case of reportable infection. Today the task of protecting the health in the county can no longer be handled by one man or a group of men with one set of skills. Water supply and disposal, housing standards, air pollution, control of vectors, detection of radiological hazards, and garbage and trash disposal are all part of the health officer's responsibility. New techniques must constantly be mastered, new approaches learned.

While the job of the health officer and planner has been getting larger and more complex, so is that of the government official. It used to be that when you wanted something, you simply went to a politician, explained the problem and got the necessary answer. Some of you may still be able to accomplish your ends in this way. However, the demands on officials at all levels of government have increased. Their constituents want and demand more and better services of all kinds. At the same time, these constituents are protesting the increased burden of taxation and bonded indebtedness. They have learned in remarkably large numbers how to split a ticket when they vote. Their party loyalty may not be as great as it once was, or they may believe that at the local level the cleanest government can be achieved by a so-called nonpartisan party. The jobs of the elected officials are a lot more difficult and seldom as secure as they were. The politicians have found that they must pay attention to the citizens.

From the earliest days in this country, citizens banded together in voluntary groups to provide for defense, education, and welfare. Think about yourself as a citizen. You probably belong to a professional group from which you expect to derive information which will advance your knowledge and welfare. You probably belong to a social group, to a veteran's organization, to a church, a neighborhood civic association, the PTA, an alumni club, a political party, and some kind of special interest group such as the Izaak Walton League. To some you pay dues for which you may receive a monthly or quarterly bulletin. Others have meetings which you attend. In all of them you find people with similar interests or similar goals. Through them you expect to take some kind of action, action which you as an individual might hesitate to take. The group frames resolutions which the leader or leaders would support as the occasion arises. The group as a whole rakes action as when a neighborhood group embarks on a clean-up, fix-up campaign or a PTA decides to fix up the school playground and the fathers devote time, effort or money to building the needed equipment, seeding the lawns, building the fence. Today the role of the voluntary group has become larger and more complex in the same way that your job and that of the elected official has increased. There is so much to be done! The church group now has a social action committee, the alumni group is trying to advance faculty salaries, the professional groups are taking a larger part in legislative action, the civic associations have spread their interest to larger areas than their own immediate neighborhoods. The most recent Presidents of the United States have called upon citizens to make greater efforts than ever before to solve some of the nation's most pressing problems. The voluntary organizations are responding.

You have undoubtedly heard the voice of the citizen in the course of your activities. In the matter of solid waste disposal, the voice is largely negative. Individuals complain about the carelessness of garbage and trash men, or they grumble about litter in the streets, alleys and parks. Individuals banded together in groups protest the need for municipal or county management of trash and garbage collection and they most vociferously do not want an incinerator, a dump, or a sanitary landfill in their neighborhood. In fact most people either give the subject no thought at all, or, if asked for an opinion, will say that refuse should be placed as far away as possible from human habitation. A friend of mine who lives in a rural county told me that she has no problem, she calls the trashman when she has a load and he takes it to the next county. She did report that the neighboring county is beginning to get a bit stuffy about this practice.

Ten years ago people were just as apathetic about working for sewage treatment plants. Active citizens concentrated on needed improvements in schools, better highways and more recreation facilities. The need for such expenditures was more evident. The results of pressure for such things were more immediate. After all, the water pollution affected the town downstream, not the community itself. Today, however, citizens all over the country are informed about the problems created by lack of sewage treatment. They are supporting bond issues to provide the necessary facilities. They are pressing state agencies to enforce existing laws or are urging state legislatures to pass stronger legislation. Universities in every state, partly as a result of popular interest, are conducting research in water problems, some of which may result in new or improved or more economical methods for handling sewage. The voice of the public can be positive, especially if the public is aware that a problem exists.

How can you arouse public interest [illegible] make the citizen aware that garbage and trash is still a problem after it has been removed from his back yard? There is of course always the mass media; radio, television and the press. These thrive on matters they consider newsworthy. Disposal of solid waste does not seem to be of value as news until the matter has already become controversial and citizen attitudes are already hardened. Efforts to achieve a satisfactory solution at this point are frequently too late. But news could be made early. One device that is more and more being used is the citizen advisory council or committee. The more successful committees are composed of leaders of a broad section of the community, members of recognized organizations.

You know, of course, that there are hundreds of organizations in operation in every city. It seems as if almost every American citizen, by virtue of his occupation, his religion and his interests is a member of at least one and probably more nearly a dozen.

There are six different groups of active organizations. The largest and most important is the business group; the Chamber of Commerce, National Association of Manufacturers, various industrial associations. Then there are the patriotic and service organizations, such as the D. A. R., the veterans groups, the Navy League, and so on. Next come the reform groups, such as the American Municipal Association, the League of Women Voters, the National Civil Service Reform League and the Women's Christian Temperance Union, for example. There are farm and labor organizations and lastly, the special purpose groups, such as the PTA, professional associations, conservation groups, political parties. Seldom is a single group effective on its own. And no one group is outstandingly effective in every community. It pays, the League of Women Voters has discovered, to know the organizations in each community, who the leaders are, and which can be expected to be helpful on any given issues.

The citizens advisory committee might then be composed of a half dozen or ten or fifteen leaders from groups of the kind I have just mentioned. They as individuals would want to know the facts. People like to feel important. They like to think they have had a hand in the planning of a project and in the development as the project takes place. They sometimes even like to think that the original plan was their own. So the advisory committee is given the facts and hopefully they help to plan the solution. Moreover as individuals, people don't always like to make choices but they do want to know what alternatives there are to any course of action. They are uncomfortable when they believe they have had no choice.

Armed with basic facts and possible alternative solutions to a given problem, at least some of the members of the advisory group will report back to their own organizations. If the problem has an appeal because of its urgency, the individuals of the committee will probably respond that much more readily. Almost all citizens groups have one thing in common. They hold meetings. No one could be expected to talk to all of them, but a number of them, once they have adopted a course of action, send speakers to other groups. A group fired by the leader from the advisory committee might request your services as a speaker. Of course different groups expect different things from a speaker. All want to know facts but some are primarily interested in costs of various possible solutions. Some are more interested in results from the health or aesthetic viewpoint of the different alternatives. Some want all kinds of details, some only superficial facts. Some devote five minutes, some two hours to talk, question and answer. Some like films, film strips, visual aids, pictures. Others like reading material such as flyers, or pamphlets.

Citizen organizations sometimes initiate a cause of their own. In such cases, of course, something drew their attention to the need for a campaign. Once their attention is aroused such organizations usually proceed through four steps.

1) Getting the facts and making friends.

2) Choosing a course of action.

3) Building public understanding and support.

4) Expressing public support where it will count.

Let's start with the first step, getting the facts and making friends. These may seem like strange activities to group together but the truth is they should be pursued simultaneously. To get the facts an organization might make a survey of what is being done in the area with respect to waste disposal. It might get the facts on a specific situation and find a basis for evaluation, such as what other communities are doing or the costs of alternative methods. It would find out who the responsible officials at local and state levels are, get acquainted with them and try to find out what their programs and plans are. To make friends the organization would find other organizations with a common interest and certainly try to make friends with the press. It would understand the opposition and where it is likely to come from. It would get whatever help is available from reports and personnel. It would check on whether state or federal aid might be available and what local requirements must be set before the most desirable solution can be attained.

In the second step the organization would choose a course of action. Members would consider the following: Is there a need to build public awareness of the problem? Should discussion be encouraged? Is it necessary or desirable to try to compromise conflicts? Should a specific proposal be supported? Should there be continued backing of appropriations for an existing program? Do officials need to be prodded to attack a problem? Should there be encouragement for an official study? Does implementation of the study or plan need to be supported? Is local participation in a metropolitan or regional development required?

To build public understanding and support, information must be taken to other groups. The sponsoring organization might develop a speakers bureau, might have colored slides or film strips. It might sponsor a Go-See trip to possible sites, to other communities, to see specific methods of treatment. The organization might print or distribute pamphlets, or current information, flyers, answers to common objections, or it might supply background material for other organizations' bulletins. A study or survey involving representatives of a number of organizations might be initiated. Workshops for leaders or conferences with a panel might be sponsored. At every step, public relations and publicity will be an important element. What will make news? What coverage can be anticipated? Is there some one person on the newspaper or at the TV or radio station who might have a particular interest in the subject or could be encouraged to make the crusade his own?

And finally the organization will see that public support is expressed where it counts. It will feed information or ideas to local officials and report support for those ideas. It will make statements at hearings or before the city council. It will try to establish a joint action committee for a big push to get out a "Yes" vote for the needed appropriations. As you can see, the job of the organization has really become complex.

The complexity of a successful campaign by an organization presents difficulty to the official who would like to see one of his projects undertaken by a given organization. No organization can undertake more than one or two efforts of this scope at one time. The schedule for such an effort is mapped out well in advance of any apparent activity.

The organization has to inform its membership before the members will be willing to take action. Materials have to be gathered and prepared. Sometimes the first step of informing the members takes a year or two. To sell a project to an organization takes skill and enthusiasm. To coordinate official schedules with the organization's requires patience and persistence. The organization will need all these qualities too to be successful later. When skill and enthusiasm, persistence and patience result in a successful achievement every one who had a share in the outcome is truly rewarded.

My knowledge about organizations comes chiefly from the League of Women Voters. We are a relatively small organization with some 145,000 members and yet over the years we have received a reputation for political effectiveness. The steps in a campaign have been learned by practice. If you will permit, I should like to give some case histories from League files.

Every one of our more than 1200 local Leagues has made surveys of different kinds and for different purposes. One League actually measured front footages in a community to prove that tax assessments were not equal and that equalization would provide additional revenue for the township. One League went from house to house with a questionnaire and proved that all the houses in a particular neighborhood were substandard. Another League took samples of the water supply at various times during a day, the month, and the year which they sent to the state health department for analysis. In the process they proved that the local water supply was not fit to drink without treatment. Still another League selected the most likely spot for a public housing development.

Should a League become interested in the problem of solid waste disposal, it might well wish to undertake a survey of various methods used for disposal or of possible sites for the facility.

Most Leagues have speakers bureaus. A number have reached as many as one hundred fifty different organizations with information on a campaign they were waging, be it for public housing or a sewage treatment plant. They have sometimes made film strips which shocked people into awareness of a need. They often take bus or boat trips to see for themselves what problem exists. Such trips usually make news, sometimes get television coverage. Frequently the excursions are open to the public. Leagues have printed flyers and pamphlets for public distribution. One League printed napkins with an attractive picture of a park and information about an open space act which was coming up for a vote. The League got a number of popular restaurants to use these napkins. In fact League members have used all the techniques I referred to earlier.

One story that is pertinent to your interest is the tale of the League that was interested in trash collection.

Countering a Special Interest:

Some years ago the question of banning backyard incinerators was up before the L________ Board of Supervisors. The question was whether the smog-producing incinerators were to be replaced by privately owned companies which wanted a franchise to pick up the rubbish or by a city owned service. The League had concluded that collection of combustibles was a city service, but of course there was much opposition from those who wanted to do the collecting. The chairman tells the story:

"One hot June evening my phone rang and the president of the League, Mrs. _________, informed me that the city council was meeting in the budget session and was to discuss whether to include $3,000,000 for the first year's municipal collection of rubbish. This was to take place the next morning at 10. What could we do? Inconveniently, it was the first day of school vacation and everyone had children at home. . . . Who would go to the City Hall?

"A quick conference that evening produced a bit of ingenuity. We decided to take children and have them hold placards in the form of nursery rhymes. We would march up and down City Hall, then quietly fold our signs and sit in the council chamber for the hearing.

"The next morning fifty odd women and children were marching to the tune of television cameras and photographers with signs reading: 'Jack and Jill went over the hill . . . they couldn't pay their rubbish bill!' or 'Cinderella sat in the ash . . . no one came to pick up her trash,' etc.

"Everyone now knew we meant business and that we would fight for our stand. We were not against the private collector, we were careful to explain, just for municipal collection. Since issues of corruption in the rubbish industry were raised by other sources, we had to be careful to steer clear of this angle which was not a proven fact with us. The council authorized the expenditure of the money."

Since the League is small and feminine it has also learned that to be effective it must sometimes work with other organizations. These days joint effort by numerous organizations is becoming the rule rather than the exception. Guides to community organization can be found in numerous fields of civic enterprise. They list groups which might be expected to join in the endeavor. They outline procedures which might be followed. At present, there are no organizations that I know of nor such guides in the field of the disposal of solid wastes. However in the wake of the White House Conference on Natural Beauty a new organization has been created called Keep America Beautiful. Some seventy organizations and agencies belong nationally, including the National Association of Sanitarians, the Conference of Municipal Public Health Engineers, the Conference of State Sanitary Engineers and the American Planning and Civic Association.

The current drive of the organization is aimed toward preventing litter, toward making sure that there are plenty of refuse receptacles. Can the members of the participating organizations be made aware that collection into receptacles is but the first step toward disposal? Where is the trash and garbage to be burned or buried? What can be done with the unbreakables such as the plastic soft drink and beer bottles which are now such a common sight on the landscape? Attention is being called to the unsightliness of billboards and auto junkyards. Certainly the need to dispose of the more unsightly results of human waste deserves recognition. If such an organization as Keep America Beautiful would adopt your cause, you could hope for nationwide publicity. Nationwide publicity would start the process of informing the public on the need and the enormity of the problems associated with the disposal of solid wastes.

Perhaps you cannot wait for national action of this sort. Is there an organization in your community which might take the lead in organizing for action? Now would be the time to start looking for one if you would like action two or three years from now.

If your problem is really acute -- you need a new incinerator or a new site for a sanitary landfill right now -- you might wish to follow the example of a public utility in California.

Early Citizen Involvement

In L____________ the Department of Water and Power has developed a program to obtain public acceptance and understanding with a minimum of objections. The steps include:

1. Notification of public officials in advance of the first announcement of the project.
2. Preparation of the fact sheets and other information for the press and television and radio stations.
3. Special internal communications such as bulletins to Department executives, key and public contact personnel and employees working in the area in which the facility is to be located, explaining the reasoning behind the project.
4. Special efforts to inform certain opinion leadership groups very promptly by personal calls and informational material.
5. Presentations before local organizations, using talks, films, written and visual material.

On all occasions the opportunity is taken by all employees who may contact the community's business, financial, and civic organizations and the area's homes, schools, and churches, to tell the utility's story.

When the facility is completed, the public is a worthwhile goal second only to reliable, efficient, economic, and courteous service.

Is there a way to demonstrate that a landfill can be attractive or that the smoke from an incinerator can be controlled so that it is not objectionable? Recently I heard of a sewage treatment plant in need of secretarial and clerical help which brought prospective employees on a Go-See tour. The place was so clean and attractive that the city had no difficulty getting employees although previously mention of the job had discouraged applicants. The place sounded dirty.

On a nationwide scale the problem of solid waste disposal is one which will become more acute as time goes on, as the population continues to grow, as open space becomes harder to find, as suitable sites for disposal become scarcer. It is a problem that will be with us for many years. Perhaps it is just as well. Democracy is not efficient. It takes time and effort to arouse citizens, to develop decisions, to reach the action stage. Working with citizen organizations is a practice in democracy. It is a cumbersome, sometimes frustrating process. It took one League twenty years from the time the need to replace substandard housing was recognized publicly to convince the city council that public housing might be necessary. It took another League twenty-two years to get the oft-amended zoning ordinance replaced with a new and workable zoning law.

This training session is the first on this particular subject. I am sure that there will be many others as time goes on. It is to be hoped that the public attention you have aroused and that succeeding conferences may attract will begin the process of citizen education which is necessary for the citizen support which may be needed for satisfactory solution of the problem of disposal of solid wastes.

MR. ROSENDAHL: Mrs. Rosenblum has agreed to answer questions.

MR. FLOOD: Where does the money come from? How are you financed, Mrs. Rosenblum? Is it financed through dues from the members?

MRS. ROSENBLUM: One-third of our financing comes from dues, one-third comes from member contributions, and about a third comes from friends of the organization.

MR. KALKHOFF: I have been in locations where we have gotten the cooperation of organizations up until the time the facility was built, be it a sewage treatment plant or an incinerator. The interest ran very high for one month, and then after that, apathy set in and nobody visited anymore. You go back to the unit and it would be, in the case of the sewage treatment plant, misoperated. In case of the incinerator, you could see it when you were approaching, and being foolish, I went to the local clubs that had been so strong for it and asked what they were doing about it, and they said, "We have another project."

How can we keep them interested in it after it is built? We can build them so that they will work, but the citizens don't police them, they will still pollute.

MRS. ROSENBLUM: Well, I think the only way you can continue to hold up the interest is by pointing out that a problem still exists. Really, that is it. This is done in the same way you aroused the interest in the first place. They are aroused only because there is a problem. You have to convince them there is a problem.

FROM THE FLOOR: Sometimes we are a thousand miles away and we can't raise local interest by just being there for a couple of hours.

MRS. ROSENBLUM: Well, I don't know. The trouble in the League of Women Voters, once we get a problem, we never seem to be able to get rid of it.

FROM THE FLOOR: For several months I have been meeting with ladies' groups to publicize and get their assistance on programs which have been approved by our legislative people and administrative people, and we want the League to be with us.

I came up with something roughly like the outline you gave here. My question is how soon could I get a copy of this? It is a lot more meaningful than mine was.

MRS. ROSENBLUM: I think you will have to get the course from Mr. Robinson, although I believe in your course manual, the outline is there and most of the points are included.

FROM THE FLOOR: I get the impression here that you worked on the program to "Keep America Beautiful." I wonder if you could answer a question for me. I tried to work with them when they had their meeting in Dearborn, Michigan, two years ago and I am trying to work hard with "Keep Michigan Beautiful" and they just want to collect the refuse, but they don't care where it goes.

I think this suggestion is well worthwhile. Do you know how we can break in and get this interest in it?

MRS. ROSENBLUM: I am sorry, I don't work with them at all and I don't know anybody on their Board at the present time. I just got their flyer which outlines a good program as far as collecting literature is concerned, and that is as far as it goes.

When I look at the national organization to which I belong, some of these are quite effective politically. The local ones might not be so effective. You have a pretty good League in Lansing, you might try them.

I can't assure you that they will do anything, but you might ask them for some help on how you go about getting the other organizations to do something.

FROM THE FLOOR: Will this talk of yours be put in your national publication, do you think?

MRS. ROSENBLUM: No.

FROM THE FLOOR: Then, we guys are privileged. If we want to use it as a means of attracting or getting the local League into it, I was thinking that it might be worthwhile to show this to them.

MRS. ROSENBLUM: The League of Women Voters is a grass-roots organization. The national never tells the local league what to do. They decide for themselves.

MR. ROSENDAHL: On behalf of the United States Public Health Service, the Ohio Department of Health and all the members present, Mrs. Rosenblum, we wish to thank you at this time for taking the time to come out here and bring such a wonderful message to us explaining the work of the League and what can be done.

HHFA AND ORDINANCE ENFORCEMENT

MR. CRANE: Our next speaker will talk about the HHFA and municipal ordinance enforcement. He is Mr. Kenton Williams, the administrative assistant to the Chief of the Rehabilitation and Conservation branch of HHFA in the Chicago Regional office.

He has his Bachelor of Science Degree in urban land economics from the University of Illinois. Ken has been with the HHFA for the last four years in his present position.

MR. WILLIAMS: I want to thank you for letting me join your meeting here today. As you know, Mr. Wall was scheduled to speak to you at this time, but he was called to Washington for a special meeting, and he asked me to tell you he was sorry that he could not be here.

I know you have been listening to speeches and panel discussions all week, and since I am the last one on the program today, I hope you will forgive me if I try to keep my remarks fairly brief.

I understand that this training session is one of the first of its kind ever to be held. After reading about some of the problems pertaining to the disposal of solid waste materials, I believe your meeting here this week is of utmost importance and is certainly not being held any too soon.

One expert has pointed out the seemingly ironical fact that our refuse problems, which may be classified as strictly urban problems, become much greater as our population becomes more affluent. It seems only logical that with our greater economic strength and increased prosperity we should be able to do much more about solving these and other critical problems that threaten the very lives of our great cities and metropolitan areas.

What I would like to tell you about today are some of the tools available through federal programs that are being used in large and small cities alike to help cure the ills of urban decay.

My topic is, "HHFA and Municipal Ordinance Enforcement." First of all, what is HHFA? The letters stand for the Housing and Home Finance Agency, which was created in 1947 to direct the federal programs and policies concerning housing and community development. HHFA fulfills this function largely by coordinating the activities of its five constituent agencies, which include:

1. The Federal Housing Administration, or FHA as most people call it, which insures private lenders against loss on property improvement loans and home mortgages.

2. The Public Housing Administration, which provides federal assistance for low-rent public housing.

3. The Federal National Mortgage Association, usually referred to as Fanny Mae, which buys and sells FHA and GI home mortgages.

4. The Community Facilities Administration aids communities in planning and building needed public facilities; it also makes loans to build student and faculty housing at colleges and universities, and housing for senior citizens.

5. The fifth agency under HHFA is the Urban Renewal Administration, the one I work for. Our purpose is to provide funds for comprehensive urban planning and to give financial and technical assistance to communities undertaking urban renewal activities.

Urban renewal can involve slum clearance, neighborhood rehabilitation, code enforcement, or combinations of these treatments.

Clearance activities require the relocation of families to standard housing. Neighborhood rehabilitation and conservation programs, on the other hand, try to upgrade existing areas with a minimum of displacement. Two major involvements not commonly understood about urban renewal are:

1. Urban renewal programs are initiated, planned, and carried out by cities, not by the federal government.

2. The bulk of the new construction and property rehabilitation is done by private enterprise.

One of the aids supporting renewal activities is the open space land program. This program was created to help state, local, or regional public bodies to acquire and save predominantly open space land for recreational use. The 1965 Housing Act increased federal grants to cover 50 per cent of the cost of acquiring and developing the land for parks, playgrounds, or natural conservation areas.

Another thing the new Housing Act allowed was the acquisition of land in built-up urban area, which can be cleared to provide open space if there is a deficiency of undeveloped land available.

One of the special features of this program, which you may already be aware of, is that open space grants are also made to acquire sanitary land fills, provided these sites are developed for recreational use within 10 years.

The individual renewal plans and projects of any city should be guided by a comprehensive plan for long-range needs. To help state and local governments undertake comprehensive studies of this sort, the federal government provides urban planning assistance grants under the 701 Program. These studies may cover general land use requirements to meet the needs of a rapidly expanding urban population; the provision of needed public facilities; and long-range fiscal plans for carrying out the programs needed. It sounds very much as though federal money is available for almost any purpose. I want to warn you, however, that the funds we have available now can be properly used only in certain situations, and they can apply only to a certain problem. Special application requirements also have to be met before cities can qualify for these benefits.

One of the very basic requirements that any city has to meet before it can participate in most of these programs, is to show that it is marshalling all of its own resources to help itself. Unless a community is willing to pull itself up by the boot straps, it is doubtful that individual federal aids will be enough to do the job that's necessary.

It was this realization, I am sure, that urged Congress, in 1954, to require any city, before it could receive aid for urban renewal; public housing; and certain FHA benefits; to show that it is taking positive steps toward self-improvement. It does this by preparing a workable program for community improvement covering many areas of Municipal responsibility and concern.

More than 2400 communities in the United States so far have developed workable programs that have been certified by HHFA. To maintain its certification a city must show annual progress. The elements that go to make up a workable program represent nothing more than the use of tested and accepted principles of good municipal management.

As part of its workable program, a community must adopt adequate codes that provide sound standards for new construction, and govern the use and occupancy of all existing housing units. Model codes which have been developed and kept up to date by recognized national organizations are preferred, but local codes are acceptable, provided they set comparable standards and do not contain restrictive provisions that increase housing costs unnecessarily. The basic codes that are required include: building, plumbing, electrical, housing, and fire prevention.

These newly adopted codes are meaningless, however, unless they are effectively administered, the Housing Code will probably have the most immediate impact on any city's overall improvement efforts. In 1954, when the workable program idea was first established, there were only 50 cities in the country that had codes of this kind.

You may be thinking, "What does the Housing Code do?" The one basic thing it does is to provide minimum use and occupancy standards for all housing units in the community regardless of when they were built. It specifically requires that all dwellings have adequate light and ventilation; electrical outlets; basic sanitary and bathing facilities; safe structural maintenance; proper exits; adequate space for the occupants; and adequate receptacles for storing trash and garbage. The Housing Code applies to owner-occupied housing as well as rental units.

Because of the vary nature of this kind of law, Housing Code Administration cannot be successful if it becomes merely a police action. Copies of the code should be printed and widely distributed. With the help of the news media, a public campaign should be carried out in those neighborhoods where the city can concentrate its efforts for achieving the most good.

Through such a campaign, local code enforcement officials can create understanding and support for the benefits a Housing Code can provide -- not only the upgrading of housing that is presently being neglected, but also the razing of properties that are so substandard they cannot be rehabilitated. This process of public information and the acceptance of the Housing Code has been successful in hundreds of communities throughout the country.

It is an established fact that once there is an understanding by the people of what a Housing Code is for, neighborhood groups themselves will often request the city to assign more inspectors to administer the code in their neighborhoods. Only when a neighborhood is stabilized through code enforcement, can deterioration be prevented. Without a community plan; zoning; and effectively administered Building and Housing Codes, it is more than likely that, ultimately, a deteriorating neighborhood will become a slum area. Then the only type of renewal available is total clearance and redevelopment. Most people enjoy the neighborhood they live in, if it is in good condition, and they will welcome code enforcement to maintain their neighborhood when they understand that its effect will be to protect their own property investment.

The Housing Code is often the locality's chief weapon when faced with recalcitrant property owners who don't care about the condition of their homes, and who don't understand their responsibility for keeping their property in good repair, in order to protect the entire neighborhood.

Good municipal management today requires that a city protect itself and its citizens from the destructive forces of blight.

Through a Housing Appeals Board, before legal action is taken, there is an opportunity for assisting hardship cases, as well as warning that small percentage of owners who are reluctant to bring their properties up to acceptable standards. The Housing Appeals Board should have the authority to administer the code with firmness, but with discretion, keeping in mind that the standards of the codes are not to be freely abused.

There are two basic points we know about codes administration and renewal programs. First, these programs depend ultimately upon local citizen action. People must be motivated and they must be guided in some positive direction in order for these programs to work successfully. Urban Renewal regulations require that public hearings be held at which Urban Renewal and relocation plans are made public. Hopefully, such public hearings are preceded by project area meetings. These project area meetings are one factor in stimulating an awareness of community organization in Urban Renewal.

This approach means involving people right from the start, in planning programs that are going to affect their lives and fortunes.

We encourage this approach in code enforcement areas as well, where the ultimate success of our efforts depends, fundamentally, on the response and motivation of the people who live in the area.

The second basic point we know is that renewal programs are expensive. In providing for federal sharing in the costs, Congress recognized two hard facts. Number one, our cities were financially strapped -- as they continue to be -- by the squeeze between rising municipal expenditures, on the one hand, and limited taxable resources on the other.

Number two, and I think equally important, Congress acknowledged that urban blight was a national problem and that the afflicted cities could not be expected to solve it alone. The human, social and economic costs of slums spread far beyond municipal boundaries.

The size of the challenge before us was well illustrated by the President in his Housing Message this year. He said that, "Between today and the year 2000 -- in less than 40 years -- urban population will double and city land will double. It is as if we had 40 years to rebuild the entire urban United states . . . During just the next 15 years, 30 million people will be added to our cities, equivalent to the combined population of New York, Chicago, Los Angeles, Philadelphia, Detroit, and Baltimore."

He goes on to say, "The problem is the people and the quality of the lives they lead. We want to build, not just housing units, but neighborhoods; not just to construct schools, but to educate children; not just to raise income, but to create beauty and end the poisoning of our environment."

You can be sure, therefore, that the job of building and restoring our cities is not just a matter of providing public works and improvements, although these are an important part of the task. Once they are built, they must be made to operate efficiently, to provide the services and carry out the functions required to meet the needs of everyday living.

In order to be better equipped to serve the problems of cities, now and in the future, all of HHFA's activities are soon going to be absorbed into the new Department of Housing and Urban Development, approved by the President earlier this month. The Department will officially become operative within 60 days. Congress has asked that the First Secretary in the new cabinet post prepare a report during his first year in office, giving his recommendations on how all of the programs we now have should be coordinated and consolidated, and consider what other tools and resources are needed to serve municipalities.

In concluding, I would like to say that we have great hope that the new department can give perhaps new and stronger direction to individual federal programs, and focus closer attention on the bigger problems facing us. It is my own feeling that federal activities in the future, will go beyond the public works aspects of many of our programs and contribute also to the planning and carrying out of municipal services, including the important ones you are engaged in, which are vitally important in making our cities thrive.

We hope that our federal efforts can join in a partnership with local activities to see the job through.

MR. CRANE: Thank you, Mr. Williams.

FROM THE FLOOR: Could you talk a little more about the open space grants and their use for landfills, for example?

MR. WILLIAMS: Before the last Housing Act was passed, the federal grant was only 20 per cent. This has increased to 50 per cent. The federal government provides 50 per cent of the cost of acquiring the land also for developing it for open space use.

FROM THE FLOOR: Does developing then include the operation?

MR. WILLIAMS: No, it is just in making it available for recreational use for park facilities, something of this kind. It doesn't provide for the continuing of the operation. The development costs also are limited to just certain things like sidewalks, landscaping, things like this. It doesn't allow for building swimming pools and luxury things like that.

FROM THE FLOOR: This is a two-part question.

First of all, you mentioned the last act. Do you mean the one that was passed in about August of this year?

MR. WILLIAMS: Yes.

FROM THE FLOOR: And the next part of the question is this: An application that was made prior to this time, yet no action was taken on it, would they also be eligible for the 50 per cent or the 30 per cent as it was before?

MR. WILLIAMS: I would think that they could come under the provisions of the new act. It may require some amending, maybe changing some of the documentation, I don't know.

FROM THE FLOOR: Am I correct in stating that a comprehensive plan must be complete?

MR. WILLIAMS: No, they don't have to be completed, but a community needs to be working on them. They have to start on comprehensive planning, but they don't have to complete plans before they can apply for the individual programs.

They have to show, though, that whatever programs they are proposing are in conformance with whatever plans they have developed so far.

FROM THE FLOOR: What action would be required to get a new requirement under the workable program such that cities, villages, and agencies and so forth requesting renewal grants would show they are improving their methods of disposing of waste? Is that an act of the administrator, or would that be an act of Congress?

MR. WILLIAMS: It sounds like an administrative decision. I believe that evidence of this kind would certainly help cities work up a program. The workable program is not strictly bound up. It is quite flexible.

There are seven basic elements. I am sure that disposal of solid waste would come under one of these. Code enforcement is one. Financing, to show how much money is being distributed for the different municipal functions, one of the elements is administrative organization to show whether they are properly staffed to carry out the different functions is also included.

FROM THE FLOOR: In the purchase of land, would it be possible for the municipality to buy the land by contract over a five-year period or ten-year period and still receive federal help?

MR. WILLIAMS: I am not too sure about that. I do think, though, that before the money would be forthcoming from the government, you would have to have clear title to it.

FROM THE FLOOR: Is it possible or is there any way under the present regulations at all to borrow money for planning or construction of incinerator programs, from the housing department?

I think Bloomington, Indiana, got money this way. I don't know exactly when they got it or what agency. I was given to understand that it came from your agency.

MR. WILLIAMS: I don't know that we have funds for planning individual projects like that.

FROM THE FLOOR: It is the community facility. The loans are made for the planning and loans, I think, are also made for the construction. It is two separate operations, or perhaps three. There are preliminary plan loans, final plan loans, all of which must be repaid when the plant is built.

MR. CRANE: Thank you again, Ken.

FRIDAY MORNING SESSION

ROLE OF EDUCATION AND TRAINING

PANEL

MR. ROSENDAHL: We will start the session off this morning with the Role of Education and Training in Solid Wastes.

Your program states the name of Ben Linsky as being the first member of this panel. Unfortunately, Ben could not be here due to a conference in Washington called for yesterday, but we were very fortunate in having as a pinch hitter Jerry Burchinal from the University of West Virginia.

Professor Burchinal has his Bachelor's Degree in civil engineering and Master's Degree in civil engineering from the University of West Virginia and has been on the staff at West Virginia since 1946.

He is a professor of civil engineering, actively engaged in this. At the present time he is program director on a training grant from the United States Public Health Service on water supply and waste control.

I give you at this time Professor Burchinal of West Virginia.

MR. BURCHINAL: As Mr. Rosendahl said, I am a last-minute substitute for Ben Linsky because of the meeting in Washington. I am not sure it was because of that meeting or because he didn't have the paper prepared.

At any rate, Ben was to serve as chairman of this panel which will discuss the academic side of this training and I thought the method we would use for running it would be for each of us to speak briefly on the particular topics that we are most familiar with.

I think that we will have Professor Bell and then Professor Glysson give their papers, and then I will speak on the material that I have from West Virginia before I throw it open to questions.

Our first speaker will be Dr. John Bell from Purdue University. Most of you are familiar with him, having the material in your folders which contains a biographical sketch. He was born in New York at Tappan, got his Bachelor's Degree from Clarkson and he has a Master's and Doctorate from Purdue University.

He has been active in the research field of solid waste and, as you notice from his sketch, he is a member of most of the pertinent organizations that would be of interest to anyone in this field such as ASCE, Water Pollution Control Federation and what-have-you.

I would like to present Dr. Bell.

ACADEMIC EDUCATION AND TRAINING IN SOLID WASTES

By: John M. Bell, Ph.D.
Assistant Professor of
Sanitary Engineering
Purdue University
Lafayette, Indiana

Introduction

> "The universities form the foundation for teaching and research. If the foundation is weak, the structure above it will fail. In the past the universities have failed to accept their responsibilities in solid wastes. University professors have been too willing to perpetuate status quo, too willing to accept old ideas rather than to think of new ideas, too willing to be diluted by offers of fame and fortune rather than accept the responsibility of true teaching.
>
> We face a real crisis because our university professors have failed. How can we expect to have young engineers who are able to rise above the conventional concepts if the university professors are so busy consulting or doing nothing that they cannot keep up with current practice? It is apparent that action is required if we are to rise to the challenges of today and tomorrow in environmental health."

These were the words of Dr. Ross McKinney as he summarized the proceedings of the National Conference on Solid Wastes in Chicago almost two years ago. They were true at that time and, unfortunately, are still true today. It was the purpose of that Conference to bring the young researchers together, with a few key research investigators and operational people, in order that the young researchers would be challenged by problems in solid wastes. Of the 157 conference participants, a total of 53 (34%) were associated with universities. In his closing remarks Dr. McKinney stated:

> "The success or failure of this National Conference on Solid Wastes Research will not be known when this session ends. It will take several years to measure the effectiveness of this Conference. It will not necessarily be measured in terms of number of grant applications, although this criteria will be used. It can only be measured by an attitude which produces new ideas and young engineers who face the challenges."

It has now been almost two years since that Conference. I, therefore, thought it would be of interest and value to see just what progress, if any, has been made in our academic institutions with regard to the initiation of research and/or courses dealing with solid wastes.

Solid Wastes Questionnaire

The following questionnaire was developed and used in order to gather information about both research and course work at our academic institutions.

1. Are you presently conducting research in the field of solid wastes?

   a) If YES, how many students are engaged in said research?
   b) If YES, approximately how much funds are involved?
   c) If YES, what is the principal source of funds?
   d) If NO, do you have any plans to initiate any research in the near future?

2. Do you presently have a formal course(s) and/or seminar in your curriculum on solid wastes?

   a) If YES, how many courses?
   b) If YES, what are the credit-hours of each?
   c) If NO, do you have any plans to initiate any such courses in the near future?

3. I would appreciate any comments concerning your research and/or courses on solid wastes that you would care to make. Thank you.

The questionnaire was sent to 107 colleges and universities in the United States and Canada. A total of 91 replies (85%) were received as of the first of this week. In view of the fact that this survey was conducted at a poor time of the year to try to contact academic personnel, I feel that the per cent replies was indeed good.

Research Activities:

Table I is presented as a summary of the information obtained concerning research activities.

Table I

Results of Solid Waste Survey - Research Activities

		YES	NO
Presently conducting research:	Number	8	83
	Per cent	9	91
Expect to initiate research in the near future:	Number	11	72
	Per cent	13	87

	Number of Students	Funds Appropriated	Source of Funds
	5	$50,000	USPHS
	1	17,000	USPHS
	2	not available	not available
	2	8,000/yr	PHS & St. Bd. Health
	3	25,000/yr	Private Funds
	1-2	25,000/yr	NIH
	1	4,000	Univ. & St. Bd. Health
	1	5,000/yr	University
Totals	16-17	$134,000	

Needless to say, the number of universities actively engaged in research on solid wastes at the present time is very small. Less than 10 per cent of those who replied to the questionnaire indicated they were conducting research on the subject of collection and disposal of refuse. A few indicated that they were involved in the area of air pollution solid wastes, livestock solid wastes, domestic sewage solid wastes, radioactive solid wastes, etc. However, I did not include these when preparing the results for this presentation.

As indicated in Table I, less than $150,000 was reported as being spent per year on research. One hundred times this amount would still be inadequate.

This afternoon you will hear a presentation by Mr. Henry Steed, Assistant Chief of the Research Grants Branch, Division of Environmental Engineering and Food Protection, USPHS, with regard to current solid wastes research. No doubt he will give you more detailed information on solid wastes research than I was able to gather via my questionnaire. At the Chicago Conference in 1963 Mr. Steed informed us that, at that time, the Division of Environmental Engineering was supporting some 10 projects at a level of approximately $200,000 per year. If the results of my survey are of any indication of monies presently being granted to academic institutions, then it is quite obvious that we have not come very far in the last two years. I, of course, hope that I am wrong and that Mr. Steed will give us some encouraging statistics this afternoon.

Formal Courses:

Table II presents the results of the survey with regards to courses on solid wastes presently being taught and/or considered. It is quite evident that very few formal courses, dealing strictly and entirely with solid wastes, are presently being taught at our colleges and universities. To be sure, a goodly number of the replies indicated that they spent a portion of one or more of their sanitary engineering courses dealing with the problems of solid waste collection and disposal. At the most, however, it was limited to two or three lectures a semester.

Table II

Results of Solid Waste Survey - Courses

		YES	NO
Presently offering a formal course:	Number	3	88
	Per cent	3	97
Expect to initiate course in the near future:	Number	5	83
	Per cent	6	94

Number of Courses	Credit-Hours
1	3
1	2
1	3

Included on this panel with me are Professors Burchinal and Glysson, both of whom are staff members at universities that have a graduate course devoted predominately to solid wastes. I would hope that either or both of these gentlemen will give us the benefit of their experiences with such a course.

Comments:

I would like to share with you some of the comments that I received from those who completed and returned the questionnaire.

1. This area of interest has been neglected far too long. It needs to be elevated from the "garbage collection" level at which it now abides.

2. While we all feel deeply the problems associated with refuse disposal, we are presently not staffed adequately for our present plans of expansion.

3. When time and personnel permit.

4. I would bet that if one or two schools were to set up a 2 or 3 unit course in solid wastes with emphasis on lab work, we would find many other institutions recognizing the importance of this much neglected area.

5. We hope to do more in this area as time permits and student interest is created.

6. With the growing interest and need in this area, there is no doubt that we will expand our curriculum and research activities in the near future.

7. There is a lot of work needed in practically all areas of solid wastes, and I think there is some need for formal graduate courses devoted wholely to this area. Actually, a program in solid wastes could take a place beside water and air in a graduate program. I don't think too many professors share this view, but I am sure you agree.

8. Such research is costly, and requires large continuous support for too long a period to justify entering it with catch-as-catch can federal support. I have my doubts that the PHS in the near future will be able to offer long enough support at a high enough level to really do much, although I might be surprised. Good luck!

9. As you may know, we did attempt to initiate a project. . . . . but we received a less than enthusiastic response from the granting agencies. Therefore, I would say that you are going to find that most of us cannot afford to spend our time and effort in developing research and teaching in as vague and seemingly unproductive area as solid waste disposal. I say this in spite of all the noble purposes and ambitions of the recent Solid Waste Conference in Chicago, since I feel that that was a typical example of many of our "research needs" conferences

that provide a lot of noise and no action. I do congratulate you for your interest and initiative in this area, but cannot help but be somewhat pessimistic as to the probability of your success in attracting others to help spread the gospel.

10. We have had difficulty in getting research funded through the normal USPHS grant procedure. I believe this is due to the fact that the scientists on the Study Section are not willing to admit that solid wastes is a valid research area.

11. More power to you on your undertaking. The need, as I see it, is for better application of existing technology and additional research into novel and imaginative methods. In the future, physical and social planners will have to be involved so that a better understanding can be had about a reasonable period of design.

Summary

It is not difficult to arrive at the conclusion that only a few professors of engineering have taken any interest in the field of solid wastes. This is especially true when viewed in the light of the scores of competent colleagues in the wastewater field. I don't intend to give a long list of reasons why the solid waste field has been neglected. It matters little as to why the situation is as we find it today. However, having recognized the situation we must do whatever we possibly can to upgrade refuse collection and disposal. We must stimulate our students in sanitary engineering to rise to the challenges in the area of solid wastes. Academic theory must be dove-tailed with the industry's own know-how and experience.

We need the cooperation of federal, state, and municipal officials, consulting engineers, architects, industrial and mechanical engineers, public health experts, and equipment manufacturers. It is hoped that together we might take action and move forward in the field of solid wastes.

MR. BURCHINAL: To continue with our program, our next speaker will be Professor Gene Glysson who will give you some views from the standpoint of his work at the University of Michigan.

Professor Glysson obtained his Bachelor's and Master's Degrees at Michigan. He is a registered professional engineer and I am certain, although it is not mentioned on here, he is also a member of the pertinent organizations.

At this time, I would like to present Gene Glysson.

MR. GLYSSON: Thank you, Jerry. It has been a real privilege for me to attend this conference. I sat in the last rows on Monday and Tuesday and I find the information is really worth assimilating. I am a little uncertain as to whether we are going to inform you. I am sure you have informed me a great deal.

I think that John Bell's survey was extremely informative. You will find out there are very few people involved in this. That puts a little luster on what I am doing. I am referred to as the garbage man around our bailiwick and it is interesting to know that other people are interested in what I am doing.

I would like to go through my remarks here and after Jerry is through with his discussion on his course down in West Virginia, I would like to have an opportunity to describe briefly what the course is that I have up at Ann Arbor.

THE ROLE OF EDUCATION AND TRAINING IN SOLID WASTES

ACADEMIC EDUCATION AND TRAINING

By: E. A. Glysson
Associate Professor of
Civil Engineering
The University of Michigan

The solid waste problem is beginning to receive the attention which it so long has deserved. The tremendous magnitude of the problem has been described by other speakers earlier in the program. The effects on the environment of the various disposal methods have been discussed with their economic characteristics. The importance of planning has been emphasized and several methods of implementation of such plans have been proposed.

Since all the aspects of the problem should be discussed, it is reasonable to ask the question, how can academic education and training help towards the solution of the solid waste problem? The question includes the words "academic education" which implies higher education such as offered by a college curriculum, and it is this type of education that is referred to in this discussion.

It is the responsibility of those educators who are involved in training persons who may become involved with public works in any way to include in the curriculum an adequate discussion of the solid waste problem. This is true whether the student be interested in planning, designing, public health or any other related area of public works. The emphasis and approach to the problem will differ when included in different courses, but the topic is as important in a curriculum in planning as it is in a sanitary engineering curriculum. The student should be given an idea of the magnitude of the problem and its effect on the environment as viewed from the point of view of the course being taught. For example, the economics of various methods of refuse collection might be appropriate in one course, while the health aspects of different collection methods would be discussed in another. This concept should be included in selected undergraduate level courses as well as at the graduate level, the difference being more in depth than breadth.

It is the responsibility of the educator to keep abreast of the field of solid wastes as it affects the areas of his interest so that the information he has is most helpful and useful to his students. This means collection of as much current information as possible from the literature and other sources as well as any research that he himself is doing or of which he is informed. There is a real need here for more communication between those involved in teaching and those actively dealing with the problem from day to day. How else is it possible for information on the effects of a modification of a process or a new method to cope with a problem to reach others who will be able to make maximum use of this information? Short courses or inservice training programs of a type similar to this one being conducted here are a big step in this direction(1). Much of that which is known may merely require new application to a different type of problem.

Methods and innovations are of importance but of equal importance is justification for the implementation of such methods as a solution to a solid waste problem. It may be necessary, for example, to determine in some way the intangible costs of open dumping to balance the apparent increase in costs for a properly operated sanitary land fill before the design for the sanitary fill will be accepted. To the engineer concerned with convincing a city council of the desirability of the sanitary fill, this part of the problem is nearly as important as the design of the sanitary fill itself and must not be overlooked in the academic training provided him.

Much more is being learned now about the various aspects of solid waste disposal than in the past. For example, research on sewage sludge digestion has cast light on the effect of garbage and refuse ground into the sewer upon digestor operation. Research by Los Angeles County in grinding garbage and refuse into the sewer has resulted in much information related to the increase in suspended and dissolved solids, B. O. D. and grease found in the sewage and its effect on the sewer system(2, 3). Studies on combustion should help to develop a more efficient incinerator, both on-site and centrally located as well as for special wastes such as automobile bodies. New methods of storage and transportation of refuse and garbage are needed and are being studied(4). The effects of various methods of disposal on the environment are under scrutiny, such as potential air pollution, and ground and surface water pollution. It is becoming more and more important to protect our water supplies from pollution not only in terms of solids and B. O. D. but other growth elements such as nitrogen and phosphorous, which give rise to heavy algal and other plant growths.

An area which seems to hold some promise in regard to reducing the cost and increasing the acceptance of solid waste disposal in which education and research may play a role is the concept of salvage. Work has been done, for instance, by the scrap metal industry to try to improve the salvage of automobile bodies. It is possible to produce a very acceptable material for use by the new steel manufacturing processes, by the Proler method for instance. Compost, of course, has some salvage value, depending on the market potential. There are other areas which can and are being pursued -- waste heat utilization and metal extraction from incinerator ash, for example.

Another area in which education can be helpful is in the application of electronic computers. These machines are well known for their ability to do business computations with great speed and they are serving equally well in analysis. They have been used for some time for such things as pipe network analysis and are now beginning to be used for water shed study and other systems analysis, which includes collection and disposal of solid wastes. It is possible by the use of these machines to look at a system containing many more variables than was economically possible before(1).

A fair question to ask of education is, what is available for active practitioners in the field to increase their knowledge and update themselves? One of the most efficient means is this type of concentrated short course of one or two weeks' duration where full time is devoted to the subject. Since this one is believed to be the first of its kind, it is hoped that more will follow. Formal college courses are offered in several schools on the subject of solid wastes, either as such or in closely related courses. These, in conjunction with related courses in other subjects, make up the several curricula available leading to advanced degrees in Public Works Administration or Public Works Engineering and so on, which are available at several universities.

We cannot afford to stand still in the solid wastes field but must continue to look for new methods and improvements, otherwise the problem will grow faster than we are able to find answers. Research of various kinds at many levels holds the greatest promise for solutions. An important part of the role of education is research in which the student, both at the undergraduate and graduate level, can come into intimate contact with some particular problem. Not only is work done on the problem but in this way his interest is aroused, he becomes associated with that particular subject and feels more familiar with it, and tends to stay in that field. The research done can be as practical or as theoretical as is necessary, depending on the problem and the student. Obtaining an education today is expensive and many times students need financial assistance. If funds have been made available for research, then a capable student can receive financial assistance while pursuing the research. Whereas federal and state funds have been made available for this purpose, municipal funds have been less plentiful. More effort should be made to encourage money to be set aside for support of studies which will assist in the solution of the solid wastes problems of our society. Part of this responsibility rests with those actively working in the public works field.

The educator has a responsibility to relate the results of research to application in the field -- to bridge the gap between theory and practice. Closing this gap is essential to the rapid introduction of new technology to the solid waste field. In this regard and in many cases due to the characteristics of the problem, studies conducted jointly by municipalities and educational institutions can be very productive(5).

One other role of education is to point out to the student the opportunities to be found in the broad area of public works. We are not making this field sufficiently attractive to interest enough of our most capable people. We must increase the number of well qualified persons who wish to make a career of the public works field. Part of the job of pointing out the opportunities must be done by those now actively working in the field. Here is where the public comes in contact with the personnel involved and develops the image and concept of the work. Younger people are influenced by what they see and hear about the public works field and if it is clear from those engaged in the work that it is a stimulating and rewarding experience, they will be attracted to pursue a career in public works.

A word about some of the training provided in England may be of interest. For those concerned with solid waste management, the most important professional organization is the Institute of Public Cleansing. This organization has been holding examinations for 55 years and the Testamur Certificate is a certificate of proficiency for an officer engaged in the public cleansing service of a local authority and is an indispensible qualification. To become a member of the Institute requires possession of this Testamur which means that to become a member requires passing a rigorous examination regardless of educational background.

This type of training plus the wide respect for the Testamur by the British public has lent professional prestige to this area of public service(6).

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3. Report on a Study of the Feasibility of Disposing of Rubbish into a Sewage Disposal System, Los Angeles County Sanitation Districts, September 1963.

4. Solid Waste Handling in Metropolitan Areas, Division of Environmental Engineering and Food Protection, USPHS - DHEW, February 1964.

5. Public Works for the Future, APWA Research Foundation, Research Project No. 110, November 1963.

6. Professional Training for Solid Wastes Management in Great Britain and Other European Countries, George H. Deming, DEEFP, BSS, USPHS, 1964.

MR. BURCHINAL: Thank you, Gene.

I think he pretty well summed up one of the problems that we have in academic circles when he mentioned being ribbed about being the garbage man. This is more of a problem than anyone realizes when you start talking about solid waste in the academic field.

For those of you who know Ben Linsky, you can't talk to Ben very long without being acutely aware of two things; one, air pollution, and the other, solid waste. For this reason, among others, we do have the solid waste course at West Virginia University.

There were a number of reasons that we felt such a course had to be introduced. One of them was the students knew absolutely nothing about this field and if they are involved in water pollution, they certainly can't avoid coming in contact somewhere with solid waste, so from the standpoint of pollutional effects of solid waste such as you would have in a sanitary landfill, we felt such a course as this would be desirable, obviously. The fact that there are other methods of treatment which perhaps do not add as great an air pollution to the atmosphere as incineration may be a debatable point, but nevertheless there are several reasons that we felt that we were justified in putting in a solid waste course, plus the fact that the students had such little knowledge of this particular field.

I passed out before the beginning of the period the course outline and syllabus for the solid waste course that we present at the University. This is the second year. It is a first semester course. The second year we presented it, we made one rather radical change in that we went from a three-hour lecture course to two hours per week of lecture and one three-hour laboratory period.

As an example of the best laid plans of mice and men, when the secretary stapled these together, the first page should have been the course syllabus. It happens to be the middle page. The course outline is actually the first and last page with the syllabus being dovetailed in between.

Just briefly, any course that we have on the books at practically any university, it is necessary from inspecting groups that we always have prepared a course syllabus and a course outline. Whether the instructor actually uses these in the presentation of the course is another thing, but they must be prepared to show an inspector that here is the course and here is the outline.

If you will notice the course outline which is really the most important -- because this is breaking it down on a day-to-day basis -- we are attempting to set it up in this semester under the title of CE-349, CE standing for civil engineering, solid waste disposal, a course which covers both collection, planning, and disposal.

As I mentioned before, we will not necessarily hold rigidly to the periods as they are prescribed here, but this is a general concept of the course as it would be presented.

As you go down through the material, you see there is a great similarity in the course outline and what you have been studying and covering this week. The very fact that you are dealing with graduate students in civil engineering, or chemical engineering or chemistry, is not necessarily civil engineering as they get it in the graduate work. It doesn't imply that he knows anything about solid waste. As a matter of fact, he usually doesn't know anything about solid waste. Hopefully, he will have the background to enable him to go into this field and have some understanding of the various factors that come up. We utilize, to a large extent, some of the various fine, comprehensive plans which have been developed, such as that for the Detroit area in your course, although the formal text that we are using -- and most of you are familiar with it -- is this one on municipal refuse disposal which, hopefully, is going to be revised here in the not too distant future.

The comprehensive plans, as we make use of those, some of the consulting firms have come up with very good comprehensive plans. We have made use of those. We are not above making use of -- some people would refer to it as academical hardware literature. We want the student to be familiar with the types of collection equipment and the best place to get this knowledge is from the companies that manufacture the equipment, so we have a rather large and extensive file on the various types of trucks and various other pieces of collection equipment that are available.

As far as the actual course material that you see here, if you drop down about half way along the list of material, you see we talk about sanitary landfills. We spend a period or two on site selection, types, public health, rodent control, seepage, and ground water pollution. These are some of the factors that we consider important in our discussion of sanitary landfills. The course is actually taught at the University by three of us, Professor Linsky, Professor Jenkins and myself.

Professor Linsky will look to a great extent to the political aspects of the solid waste program in addition to some of the engineering factors as they pertain to air pollution.

I am concerned primarily with engineering features such as the actual construction practices, things of this sort.

Dr. Jenkins is a biologist and is concerned primarily with the chemical and biological properties of the different methods of treatment that we have.

The laboratory is on the third page of this outline. As I say, this is our first year with the laboratory. I am certain that it will require some revision before we are through, but at any rate, it has been tentatively set up this year to be primarily a chemical laboratory, that is, an analysis laboratory if you will note. This is analysis of various characteristics of refuse. It is not a simple proposition at all. Many of the tests are very long and time consuming and we feel that the student should know something about this.

I am sure that as we go on, not necessarily in the laboratory, but perhaps as a formal type proposition, a great deal more time is going to have to be spent on statistical studies, the right proportions for sampling. Do we know we are getting a statically representative sample, and so forth?

At the present time, a good portion of the laboratory does refer to the actual laboratory analysis of the various components that make up solid waste.

The fact that we have a single course is really not quite as bad as it sounds as far as the broad overall field for the student. In the undergraduate curriculum, the student, whether it be civil, chemical, or whatever field it might be, follows a very rigid course, not much leeway. In the graduate course the program is more or less individually tailored for the student so that no two students are necessarily taking the same program.

To give you some ideas of numbers in the two years now we have offered this course, I think we had twelve students last year. We have got eight this year. These students may be students that are following the air pollution training program, or they may be students that are following the water and waste water control program, but in the overall broad field, they are also covering this type of work.

Some of the other courses, in order to -- and we realize that it must be interdisciplinary, some of the other courses which would back up, or be background for the students would be courses in chemistry, organic chemistry, which would be the chemistry department, biochemistry which at our school is ordinarily in the agriculture school.

Then Ben Linsky actually has some of these and we have some of these listed as being desirable courses. Economic geography as well as groundwater flow from the geology department, materials handling, digital computer applications, human factors in engineering, engineering statistics, advanced engineering data, methods and analysis as work simplification from the standpoint of industrial engineering, dynamic meteorology from the physics department, complex organizations from the sociology department, problems for state and local government, public relations and propaganda from the political science department, preventive medicine from the preventive medicine department of the medical school and then, of course, courses in air pollution, water pollution, plant design that are handled in our own department.

Obviously, you can see from this number of courses, no one student could take all the courses, even in a doctoral program. He would not be able to obtain all these courses for this reason, as I mentioned before, each program is tailored to that particular student and he would pick courses which will, as much as we can make it, dovetail together along with this solid waste so that he should be, as he finishes, aware of some of the environmental problems, aware of some of the social problems which are involved in this field of solid waste. He cannot be just a trained technical man. It has got to be more than that if he is going to go out in the field of solid waste.

Running concurrently with this program we have some research in solid waste. As Gene mentioned, we are doing some work on the chemical and biological properties of sanitary landfilling, and we do bring that information into our course because we feel that it is important. We are doing some work on our own in an attempt to set up some sort of design factors for institutions, hospitals, dormitories, classrooms of this sort. We find that the architect ordinarily in the design of a hospital or the design of a dormitory has very little concept of what he should plan for in the way of solid waste handling and we are finding this out in a very upsetting way when we find the beautiful new dormitories in which the solid waste handling problem has been almost completely overlooked.

For this reason, we feel that there do need to be design standards in the various institutional type buildings, whether it will turn out to be feasible remains to be seen, but at least we are working in that direction.

On the strength of some of the material that I presented and our course here, Gene wanted to say just a few words about his course that they have at the University of Michigan, so this more or less concludes my remarks except for summing up, perhaps, that we must continue to have not only engineering, but others that have a leaning or an interest in the sciences to move into this field of solid waste. They must be made aware of the problems that are involved, both the physical magnitude and the economic problems that are involved. They must be interested or made to have an interest in research because, as you notice, we are still talking about sanitary landfills, composting, incineration. No one has come out with new and improved methods for solid waste disposal. At least, not when I came into the room, and for this reason, the field requires a tremendous amount of work yet and it certainly is up to various members at the different universities to have an interest themselves and to pass this interest on to their students.

Gene, if you would like to make a comment, you may.

MR. GLYSSON: I would say this: Professor Burchinal's description of the prerequisites and the type of student and the individual who comes to this course are exactly the same in the University of Michigan as they are in West Virginia University. His course description and objectives are exactly the same as ours. I only want to mention that we do -- at least in my course -- devote a little more time to such things as rodent control, as this affects the aspect of solid waste disposal, in controlling the environment. The control of rodents in sewers and that sort of thing is covered, as well as fly control and air pollution control as related to solid waste disposal.

We have another lecture or two devoted to another solid waste problem that hasn't been mentioned in this seminar which is quite a problem in most cities and that is snow removal. This is a solid waste that happens in some cities sometimes and it is quite a problem when it does.

The point of high rise buildings has become important in Michigan, in the Ann Arbor area. We have now an 18-story building and they are talking about a 26-story building. This doesn't sound like much, but this is a small town up there, at least everybody thinks it is and we find all of a sudden that not enough provision for solid waste has been made in those designs, so I concur with Jerry's point that dormitories and so forth and other apartment type dwellings, that some of the architects are designing and engineers are approving, don't make proper provision for the solid waste question.

FROM THE FLOOR: I would like to address this to each of the three of you. You covered the number of students you had. Are these people who actually took the course, twelve last year and eight this year, and how have your student loads been in the courses you teach?

MR. GLYSSON: About fifteen per year in my case.

FROM THE FLOOR: How about Purdue?

DR. BELL: Twenty, average.

FROM THE FLOOR: Is this required of all sanitary engineering graduate students, or is it strictly elective, fitting in the programs?

MR. BURCHINAL: Elective.

DR. BELL: Elective.

MR. BURCHINAL: As I mentioned before, it would be extremely unusual if we had any two graduate students taking exactly the same program.

I might also mention that we do have -- and we had trouble getting this through the graduate council at the university, we can accept non-engineering students in the field of sanitary and air pollution provided they have certain minimum standards, and in some cases, they will have to take, at their own -- that is for no credit -- some makeup courses.

Ben, for instance, has a couple of chemistry majors, not chemical engineers, in his course and these are a natural for air pollution.

We had a physics major last year that came over into this field. It is not confined strictly to engineering students.

MR. GLYSSON: I might clarify that required or optional question a bit. We have two programs going on simultaneously. Well, more than two, but two that I am associated with. The graduate course in solid waste is optional for the sanitary engineer. It is required for a program that I am program advisor for in public works engineering. This is absolutely required in that course. I have got a much closer control over that area than I have in the others.

FROM THE FLOOR: What is the undergraduate program at your university? What is the scope of the undergraduate work in either sanitary or civil?

MR. GLYSSON: We have a total of five semester hours. I am able, then, to interject at whatever free time I have over and above the others. This is water in one case and sewage in the other, and I have taken the opportunity to beef up the solid waste aspects wherever I could, so it is injected in those two courses that I know of.

DR. BELL: This is the same at Purdue. I didn't know the schools were so close in semester hours. We have five in solid waste disposal. I teach both courses. Again, as Gene does, I do my best to get in as much as I can on solid waste disposal.

MR. BURCHINAL: We have six at West Virginia. We went from five to six with a little manipulating around. There was one five-hour course and we have two three-hour courses plus some electives that if we can find students in the undergraduate program that are interested in these fields, we might conceivably have them in public health engineering, something of this sort. They would not ordinarily be eligible for the solid waste work because at our school, it carries a graduate number.

MR. KALKHOFF: I notice in your course that you spend very little time on incineration. I am not out here stumping for it because I will recommend landfill anytime when the economics are there, but we have got to go out and give our client the best solution we think he can economically have to dispose of this material.

We run into meetings like this, or magazine articles that say, "An incinerator, per se, is an air polluter." That is the end of it.

We don't get the publicity that the incinerators in this country are emitting less than one-tenth of a grain per cubic foot under standard conditions. These have been certified and tested by the Wisconsin testing laboratory.

We can design fairly foolproof incinerators, but we can't have them operated by fools. The American Public Works Association is giving us a very big help in this development of a constant particulate meter. When this becomes practical, you can rest assured that every reputable consultant in the country will see that the unit is equipped with it, but I think that these meetings should say that work is being done instead of "an incinerator, per se, is an air polluter."

Everytime I mention incinerator, I have to overcome the feeling that the smoking conditions that we had thirty years ago are still present and we are not helping it one bit by making statements that they are polluters and just dropping it there. We should give as much publicity to the fact that they can be designed satisfactorily, and there is very little research being done at the academic level. We are forced to do some work among the equipment manufacturers and the consultants have to go out and beat the equipment manufacturers over the head to get them to cooperate because they are not going to make anything if they don't have a market for their equipment.

There is research being done on electrostatic precipitators right now by a research cartel. The leading air cleaning people are doing a considerable amount of research, but our hands are tied. We can't take an untried design in to our client and say, "This is it," because we can't make a city a laboratory, or a county or whatever the governing unit is. I think we have got to take a positive attitude of upgrading what we have rather than just this usual thing that we run into in magazines and everyplace else. "They smoke, period."

MR. BURCHINAL: We are aware that incinerators are greatly improved now from what they were even ten years ago, and Ben is a mechanical engineer and is aware of this fact and this fact is brought out in our courses. As far as research is concerned, the only thing we need to do now is get more research money.

MR. GLYSSON: The outline of my course is different from Jerry's in the time allotment. I have two lectures a week. He has two. I devote more time than would appear on this outline. I spend about two weeks on this. You can spend a semester or a year on it, as far as that goes, but I think that recognition is made of the fact that if incinerators can be operated properly, it should be done. I want to mention that there is no reason why a municipal incinerator cannot be a laboratory if you would deem it to be. I know that there are some that are, and this is making a worthwhile contribution to the information known about incinerators.

FROM THE FLOOR: The majority of them, you turn it over to them and it is, "Katie bar the door." You can't even get in there anymore.

FROM THE FLOOR: As a consultant, when you turn over a design, you have to do a sales job to the city. Do you also sell them on the quality of personnel to be responsible for this incinerator, and set the salary range schedules and the fact that they are going to need an instrument maintenance man and a full-time member to keep the meters and the APWA particulate monitors in operation?

These instruments are difficult to deal with.

FROM THE FLOOR: My dear friend, I was in Franklin, New Jersey, in May. We had a one-eyed crane operator. I even went to a lawyer to find out how far I could go in telling the mayor my opinion.

We still had the one-eyed crane operator when I left. Exactly one and a half shifts after this one-eyed genius started this crane -- he had a mentality level just enough to get up into the crane and no matter what I said, I was told, "This is it," and he tore up $1500 worth of control equipment on the crane that day. He got the cable in a knot like this, which even I can't do, and I am an expert in tearing up a crane. He threw the whole control equipment right on the bridge, including the drive.

Six weeks later after the crane was repaired, Junior is up there again.

I have talked myself hoarse in front of the officials of the Department of Public Works, the mayor, the chamber of commerce, the junior chamber of commerce, and everyone else that if you buy a two million to five million dollar piece of equipment, why in the hell have it operated by the village idiot, but I don't seem to be able to get across to them.

A few places are operated well, such as a couple of plants in Florida. There used to be a good operating one out south of here. They had a political change. They had a man who was an expert on combustion, and had been with the local utility as a boiler superintendent. Then they had a political change, so they put in an undertaker embalmer's assistant and a bartender to run this darn thing.

This is one of the things I stump about, but we beat our heads against the wall. They say it doesn't take any brains to run it.

You go in and suggest instrumentation and they will say, "We don't need them."

I have gone in a plant six months after they had $20,000 worth of instrumentation and every damned instrument is smashed because the operator knows you have a tell-tale on him. That is one thing that everyone here should get up on a stump, and if you are going to have a solid waste disposal program, whether it is landfill, incinerator, or any other complexities, for God's sake get someone out there with enough brains to find their way there and back at night. I have seen $20,000 bulldozers just abused because they have some idiot running them.

I was at a private staff engineering meeting not too long ago. They had been kind enough to haul me to the disposal area which was a combination incinerator and landfill, which I might add was being run very well, and they had just bought a $35,000, 25-yard packer. It had only been in operation a week. The superintendent also at the same time had just bought himself a new Buick. He had something coming up, and was looking for a chauffeur. The truck came in. I said, "Why not let the truck driver take it over in your car"?

"What, in my new Buick"?

I said, "But he is driving a much more expensive piece of equipment."

He puts an idiot on a $35,000 piece of equipment, but he would not let him drive his automobile.

I am not being facetious, but that is the hardest thing in the world to convince people.

MR. BURCHINAL: That is why I was saying that we must make these boys aware that it is not all engineering.

FROM THE FLOOR: I was thinking at the state level, I can give you some instances in other facets of environmental health that are practically as bad as those Amos cited. I think this is where the states have a job to do, the fact that they are going to have to come out with some type of compulsory certification for people running these disposal devices, whether they are water, sewage treatment, or incinerators, landfills, or what-have-you so that there is a standard set, and somebody polices it. Until you get the standards high enough that the pay is there and the training is there, these bad practices are going to continue.

MR. BURCHINAL: We have hit some pretty high ones in water treatment plants and sewage treatment plants and the problem is not solved there. It stands to reason it will be a great while before it is solved in solid waste plants, too.

MR. ROSENDAHL: I think we are getting ahead of the program. If you wait until the next session, you can discuss these non-academic questions.

FROM THE FLOOR: At least, many of us here have somewhat this same problem that we are tied down to a job and would like to know more about this subject. My question is, I guess, to all three gentlemen. Do you offer a course by extension or by correspondence along this line, and if not, are you considering such a possibility?

MR. GLYSSON: No.

DR. BELL: No.

MR. BURCHINAL: No.

MR. GLYSSON: I think if there were enough interest by virtue of requests and that sort of thing, it is conceivable that we would put on such a course. We have other extension courses in all kinds of things. If there were a rather strong indication of need or an interest, it could be arranged, but none is in contemplation now to my knowledge.

FROM THE FLOOR: This is to Professor Glysson. He alluded to the fact that he felt that we needed more financial support from cities. My experience with cities is that they are working on a pretty tight budget and don't even have enough money for the proper operation.

Can you give me any idea as to how you think you can get money to send students to some of these courses from cities?

MR. GLYSSON: Well, I wish it were easy to answer that question. I don't think the cities can afford to delegate the responsibility elsewhere, which is what they have really been doing, in terms of studying a situation and problem which is peculiar to them.

It is well to note, and the United States Public Health Service has been very generous in its support, but they have to look at it with a broader perspective which is applicable to a wide range of situations. A city, of course, has a peculiar problem which is known best to itself.

I am perfectly aware of the fact that budgets are tight, but I also am aware that certain things can be done if they are really critical enough.

For example, in our area, the study of the rapid sand filter in the water treatment plant has been required and the city has done this. It has been budgeted over three years, a relatively small amount being spent each year. This was adequate to the situation. I think this is possible in other areas in city budgeting, but I want also to emphasize the fact that many cities may not have the facilities to do this research in their laboratories and the universities may be in the city which do have these facilities, but it is not reasonable to expect the university to delegate simply staff and student time to this problem for the good of God and country. You have to give them a little incentive, and you can get a lot for your money in setting up small research projects with your universities. At the same time, you can encourage students to become interested in this area.

I indicated in my remarks that we are short of help here. You have a sign out here on the door that the State of Michigan needs a couple of people. This county needs a couple. They need a couple over here, and the federal government needs a couple more. There are a lot of places where engineers are needed. We are not getting that number of students through.

You can tell from the number in these courses, it is 15 and 20, and that is not a drop in the bucket to what is needed. You can start recruiting early and you have a better chance of getting a man. If you set up a few thousand dollars -- and this looks big to a student who is going to school and paying his own way -- if you can pinpoint this money to his benefit in the junior level, give him a research project studying stack emissions or what-have-you in your particular area, he will become interested and he will feel an obligation to the community who is giving him this money and you will get a man.

This is a fact. You may not hold him forever if you can't pay him enough and other cities are competing for him, you may lose him, but you will get a man in the solid waste field where you didn't have anybody before.

FROM THE FLOOR: My question is directed to Professor Bell in particular. A number of years ago, Professor Bloodgood at Purdue University did some study on the analysis of refuse. I was interested if you people are carrying that work on. I am also interested in finding out whether your school, Jerry, and yours, Gene, have done any work which has been published.

We need results, you know. This information is really useful to us because it is pretty difficult to make an analysis everytime you design a system for your client because it is a bulky thing.

Any basic data is extremely scarce and what there is is very useful.

DR. BELL: I will answer your question first. I wish I could say that it was Professor Bloodgood that did the work and then I could say we would try to have him answer your question. However, it was actually I who did the work. I was working under Professor Bloodgood. I came to Purdue in 1957. At that time, the University had gotten some funds from the Public Health Service to conduct some research in refuse. I had not selected my thesis topic. My major professor got me interested in the field.

I worked from 1957 until 1962 in the area of refuse analysis. We were interested as a local starting point to find out the procedures that could best be used to determine the physical and chemical composition of refuse.

Up until about October, 1957, our literature was full of reports about refuse, its composition, but all you had was a bunch of data that was collected by cities who probably grabbed at random a truck, told the driver to dump it over here on the corner and they would pick through it and determine the percentages of this and that.

Realizing that much research would be going on in the future in this field, we determined that the logical place to start was to develop a sampling procedure. Naturally, in order to develop a sampling procedure and analyze it and determine its reliability, we actually had to sample refuse.

Then, in 1957 and 1962, we conducted surveys at West Lafayette, Lafayette, Milwaukee, Wisconsin, where we did a study in conjunction with Black and Veatch, at Bloomington, Indiana.

We received samples from New Orleans, Louisiana, and, in fact, we did some work for the city of Toledo, Ohio.

The information that we obtained was, of course, given and was readily available to the cities that we dealt with, and the information we still have, we developed what we thought are good procedures for the sampling analysis of refuse.

The procedures that we developed are -- at least many of them -- in the present edition of Refuse Disposal Manual put out by the American Public Works Association. You will find them in Appendix A.

I have copies at the school of the summary of the work we did between 1957 and 1962 and will be glad to send any of you, upon request, a copy of the report.

Unfortunately, after I finished being a student and joined the staff, other responsibilities in the department did not allow me to continue in the field of refuse. I am still very much interested in it. I plan at the first of the year, in fact, to start a planning facility with the Union Bag Company. I noticed this pamphlet on Trim Town. I personally have been using a Trim Town and I am not a representative from their company, as you might think, but I have been using the Trim Town containers over a year now and I think they are the greatest.

I have yet to determine whether or not they are economical for every city, but this is one thing we plan and hope to get from the sampling survey that we will conduct next year in the city of Lafayette.

MR. FLOOD: Professor, if I may interrupt, there is some research which has been done on this matter of refuse composition which hasn't been mentioned and I think it should be mentioned because apparently there is some interest in it.

Elmer Kaiser of New York University published some work on this quite recently. I believe it was in the proceedings of the incinerator meeting of 1964, ASME incinerator committee.

NON-ACADEMIC EDUCATION AND TRAINING

MR. CRANE: We will now move into a topic which I am sure is going to stimulate a lot of interest. In fact, the other panel stimulated quite a bit of interest in this subject already, the non-academic training field.

I shall introduce the chairman whom you have already met, Mr. Richard Eldredge, Public Health Service, from the regional office in Chicago. He gave us the presentation on open dumping, the only real early morning session we had.

MR. ELDREDGE: The subject during this session will be non-academic education which you have already half started. We hope that we will stimulate some comments in this session, too.

I have at my left to help on the panel John Vanderveld from National Disposal, and, of course, the other gentleman here you all have met all the way through, Ed Rosendahl.

The non-academic education is specifically designed to provide education and training to two groups, namely, the decision-makers and the doers. You know where you fit in this classification, but the decision-makers are the people who, through election or appointment, hold positions of administrative responsibility: the mayor, city councilmen, city manager, public works directors, and superintendents of sanitation. Because I always think of public health personnel as decision-makers, we will include them in this group, too.

It is obvious that planners and consulting engineers should be included in any group of decision-makers, and non-academic education in the field of solid waste disposal and collection may be as important to these persons as the individual possession of academic education.

For this reason, the decision-makers must be aware of the ability of the doers, as we have referred to them at an earlier time, as we discussed the ability of a designer to design an incinerator and an operator to get the job done.

Doers -- the men who do the operation -- also occasionally appreciate the exposure to the decision-makers' problems, for only in this manner does the worker in solid waste disposal fully realize the responsibility of his decision and, after all, this is one of the problems we have with our doers, do they realize the full responsibility of their position?

Therefore, although I recognize there are two separate and distinct groups that can profit by non-academic education in the field of solid waste, I have not limited the attendance in any of the following training courses to one specific group. The training courses I am going to outline here are some that have been or will be or should be desirable.

Since the early 1940s, the Public Health Service, through the cooperation of construction equipment manufacturers and state and local health departments, has demonstrated the feasibility of sanitary landfill for local and area-wide demonstration. These demonstrations consisted of the excavation of a trench, the depositing of rubbish, coverage, final covering and blending of the area. This type of demonstration was adequate for its times for there are many that felt that the use of such heavy equipment for this purpose was impractical and financially impossible.

Now, many agree that the operation of the sanitary landfill is not only practical, but financially possible and should they be called upon to do so, are technically capable of performing sanitary landfill operations on their own site on any given day.

It occurs to me that what we need most to supplement this mechanical operation of sanitary landfill is the demonstration of a well operated sanitary landfill that not only operates as a sanitary landfill on any given day, but also operates as a sanitary landfill everyday.

A political official may be willing to concede that the sanitary landfill demonstration that runs for one day is perfectly acceptable in the location as demonstrated, but he finds it difficult to believe that such an operation could be operated everyday near a built-up section of his community for any extended period of time.

Recently, the Public Health Service in Region V has had the pleasure of conducting a number of tours to well operated sanitary landfills. The benefits derived from these tours to these well established facilities have been many. The decision-makers were aided in making their decisions and the doers found out in many cases that it could be done.

I feel that there is no reason why this method of visitation could not be expanded to other methods of refuse disposal in conjunction with short courses illustrating public health requirements for solid waste disposal operations. These programs might be sponsored by your various public works and interested societies, with the assistance of state health departments and local health departments if available.

Background on this was a particular problem in a particular state in Region V, and as a result of this problem, newspaper officials, public officials, city administrators, and just interested citizens were taken some hundred miles away to visit sanitary landfills. Prior to this time, the newspaper publicity on refuse disposal for the community was sort of negative, like "Maybe you just ought to take it across the county line," or in this particular case, they were even contemplating taking it across the state line because this seemed to be very desirable.

After the tour of the landfills, the legislation was forthcoming on a county level. The cities' operations were completely renovated. This was partially aided by a change in personnel, but the sanitary landfills that resulted from this operation are completely satisfactory and the people in the area are delighted with the change.

The American Public Works Association has proposed a training program especially for superintendents of solid waste sanitation and solid waste disposal operators. Herb Poertner from the American Public Works Association has referred to this earlier. I am sure that if you want any more information on this, you can refer to him directly, but these programs normally would be planned in conjunction with universities and colleges to take advantage of their academic personnel and class facilities.

These programs will specifically highlight the operational problems involved in storage, collections, and disposal of waste. Further information, as I say, is available and probably from Herb. I understand these courses are going to be getting off the ground in the spring of 1966, hopefully.

The Public Health Service, of course you haven't heard us say too much about available non-academic education, mainly because we are walking a narrow tread today. I understand that they are preparing to vote on Senate Bill 306. As a result of this Senate Bill 306, there will be funds for demonstrations, training, as well as research grants, but if this bill does not pass, we are limited in our resources to a very few people in the national program. We want your assistance for this type of programming, but there are darn few of us, as you probably realize. We will try to keep you informed and proceed with all haste with the training programs, and we would foresee that it could be possible that correspondence courses -- somebody talked about them here today -- might be developed in the non-academic field.

It is not our responsibility to take care of the academic training, but along with this grant program will be funds to substantially support academic training, and Mr. Steed will carry this message to you later.

In conclusion, before I introduce the next speaker, I just want to emphasize that good waste facilities are designed by persons with academic training, usually operated with persons with non-academic education, and are decided upon by well informed decision-makers. Good refuse storage, collection, and disposal does not just happen. It is organized. It is planned. It requires a great deal of planned non-academic education as well as academic training.

The second member of the panel I will introduce before I sit down is Mr. John Vanderveld, Jr., who is president and chief executive officer of the National Disposal Contractors' Association which is considered one of the nation's leading refuse disposal firms.

His operations include nine land reclamation projects, contracting service which provides a refuse collection service using a fleet of approximately 200 trucks in 21 municipalities in four states. This is almost coast-to-coast, incidentally.

He became a recognized authority in refuse collection and sanitary landfill operations. I think he is a recognized authority on these subjects. He has spoken at the American Public Works Association at its national conference, and I understand he is in great demand now as a speaker.

His formal subject or topic is refuse disposal, refuse collection. This time he is going to address himself to non-academic education which he has established some precedents in the field for a local contractor.

MR. VANDERVELD: Non-academic training is very close to us. Having about 400 employees doing the actual work as well as supervisory and management and office and clerical help, this question is very close to me. The type of help that you are able to attract to do this work needs education, generally. This week a lot of garbage has been kicked around. We are going to bury some of it now, some of it we are going to burn, some of it we are going to reclaim and change.

Our ancestors in the Stone Age, of course, didn't have this problem. The women didn't have to wash the dishes and get rid of the rubbish. There were no dishes. During the meal, the people ate their oysters and roast meat, and over their shoulders went the shells and the bones. Then, as the heaps of refuse built up into mounds, of course, the country was wide open so they just moved away from it.

How different it is today. Occasionally we still find it, but if people were to throw the bones and shells over their shoulders today, especially out the windows of highrise apartments, I think it would be rather anti-social. In some of the poorer sections where we have highrise apartments, I understand we still have problems along this line.

Surprisingly, it has only been in recent years that this subject has really been getting a lot of attention.

Our officials are becoming more conscious of the problem. Rather than pushing it into the background, now it is a matter of concern. It appears on the surface that a good deal has been done to cut down the quantity of household garbage. New packaging, semi-prepared foods eliminate food waste. Much of what is not eaten ends up in the kitchen sink, but we who are involved in this area of public health know, of course, that new packaging methods, practices that have reduced the amount of organic garbage and greatly increased the amount of household waste which has to be collected and disposed of. No one will argue that the problem has reached an alarming proportion. Frankly, gentlemen, the reason so much attention is given to this problem today is because the storage for garbage, refuse, and collection in this country has been allowed to be a distasteful subject.

Communities all over our country have avoided it like a plague. The housewife wants it taken away from her back door promptly and neatly, but she couldn't care less where it goes after it leaves her back door, as long as it is on the other side of town and it doesn't raise her taxes.

Elected officials learn quickly that campaign promises to spend money for a new disposal facility does little to encourage votes. More likely it will incur brickbats. It is human nature to avoid the subject and hope they won't have to face petitions and emotional citizen groups while they are in office.

As a result of this attitude, public works departments are often hamstrung with skimpy budgets for solid waste disposal. This is one of the points that was made earlier.

Poor dump operations are ignored. Zoning boards refuse to cooperate in efforts to locate disposal sites within economical hauling distance. Finally and inevitably, the federal government moves in to solve the problem that local communities have refused or failed to act upon, as evidenced by Senate Bill 306.

We certainly endorse any and all efforts directed at developing improved methods on this critical area of our modern civilization. It is undeniable that better techniques are in order. The highly involved technical research is not going to help us a great deal today, next month, or even next year.

The point I am leading up to is that the problem which we face today involves the people and communication with these people.

How do we reach them? How do we help them to understand that the problem is really theirs? What has to be done and why?

I propose as the first step to insure our own departments are in order and our own operating people know their job and are capable of performing with high efficiency. This establishes the need for non-academic educational training.

As Dick mentioned, our firm is operating at nine sanitary landfills, approximately 200 trucks in refuse collection. We place great emphasis on educating the working man. The man on the tractor operating a sanitary landfill knows why he is doing it, why his performance is important. His enthusiasm will be greater. He will perform more satisfactorily. It is important that he understand the functions of his machine, its limitations, its ability, and the care necessary to keep that machine operating at peak efficiency.

All of our sanitary landfill operators undergo thorough training with an experienced operator or trainer. Before being given the responsibility of operating a landfill, he must prove his ability and his immediate supervisor must be assured that he has a complete understanding of what is to be accomplished. The standards of performance must be established.

It is, of course, our responsibility to communicate this understanding to him and then follow up his training and performance with supervision by our sanitary landfill engineer.

Our operators are taught to read and understand the engineering drawings of the total operation, the carefully followed grades set out by the engineering department, and diligently follow the standards which have been established for all of our landfills.

It is, of course, our responsibility to communicate the understanding to him and follow up this training and performance with supervision.

As an example of this, just Wednesday night of this week we brought operators from all of the operations up to Barrington where our home office is and had people from Caterpillar Tractor Company come in. They sent in ten people from the factory and spent the entire evening with our operating people and our supervisory personnel that are engaged in land fill operations, going through the complete maintenance and operation and problem areas on the equipment that they had there.

This is non-academic education, but these are people that are doing the work. These are the people that have to know why they are doing something, what happens if they don't do it properly, and they have to know what the final results should be and what they will be.

The importance of insuring that an employee understands the Why of his employment as well as the How is nothing new. This theory has been expounded upon by every authority in the field of human relations, but it is particularly important in our field of sanitation and solid waste disposal because proper performance is so vitally important to public health and public acceptance, and proper performance has to start with the operator who has developed the desire to do an excellent job.

Incidentally, we frequently operate a training program for municipal employees preparing them to operate their own landfills. This is particularly helpful to smaller communities who do not have the experience and the personnel to establish their own training programs.

I mention at this point that non-academic training is available if we look for it. I am sure there are good operators and people that can give this training in Ohio and other places.

The same approach to operator training applies to the men working on the trucks. In this case, however, in addition to thorough and continuing training and driver safety, personal safety, it is extremely important that the men be taught courtesy in their contacts with the homeowners and business establishments that they serve. It is sad testimony for any community that allows the image of the garbageman as a dirty and low-class laborer to prevail, for such an image does exist. When it does, public officials and department heads are to blame. Clean uniforms, personal cleanliness, and a consistently courteous attitude is all that is needed to destroy the image of the man who collects the rubbish and does the work.

Before leaving the subject of training, I would say we ran across a training film put out by Long Beach, California. We have used it extensively. It is one of the best that I have seen. It was put out showing different phases of their refuse handling, collection, and disposal program. They show it to their employees. We secured a copy of it and we show it to our employees. All new employees see it. In fact, we found it a helpful refresher course. We have shown it at many of our safety meetings. It is a 16 millimeter sound film and lasts about 25 minutes. It is highly recommended as non-academic training.

Finally, I would like to again refer to what I consider the most critical and most frequently neglected aspect of this training. I am referring to educational communication with the public. Before we can go to the general public, of course, our own house has to be in order. I have been talking about that phase, but if we stop there, we have wasted our efforts.

When newspapers across the country continually refer to the best engineered sanitary landfills as the garbage dump, it becomes crystal clear that public relations, publicity, has fallen down, but that it should be greatly accelerated now in its essential service. The point is vividly borne out by the example of strong public relations and publicity given to President Johnson's well developed program for beautification of highways and cities. If the press is hostile, we can squarely admit that this hostility results from the fact that many landfill and disposal operators have not agreed upon a planned program from the beginning, from the time of presenting the idea of a landfill to a community, to the site selection and daily operation, many community officials fight a defensive action, merely reacting to public opinion.

This vacuum in public education is all the more surprising because a properly engineered and properly operated sanitary landfill is a benefit to the community. The public education program was planned for solid waste collection and disposal. If this were done half as well as many other glamorous public works' projects, the public resistance could be greatly diminished or eliminated. It could be a subject all its own.

As strong as I feel about it, I have to resist the temptation to expand on it. In fact, I should summarize my observations.

I first talked about the problem. I doubt that anyone will challenge that it is an acute problem involving the need for improvement and the existing method, the need for long-range research.

Finally, the need to stimulate public acceptance and understanding of the problem.

We then get down to how to resolve these needs and the groups selected for study by this panel is non-academic education and training. I propose that the first step in this direction is to improve our own organization through a well planned and well implemented and thorough employee training program. This should go beyond the basic fundamentals of the technical job assignment and care should be taken to insure the employee understands why his job is important as well as all the other objectives of his job.

Only after we are certain our own house is in order should we turn to education of the general public, an area that has been terribly neglected.

Incidentally, by way of educating the general public, on October 4 -- I believe a week from Monday -- the Illinois Municipal League is meeting at Peoria, Illinois, where we have a sanitary landfill and our company is a part of the program. We are putting on a sanitary landfill demonstration at the site. It is a site that has been operating for five years, handling the complete solid waste disposal for a city of 130,000 population. We are setting up a tent on the landfill and are going to serve a lunch over there, on top of garbage. If anybody is in the area on October 4, you are welcome to come.

I am convinced with a concerted effort along these lines, the collection and disposal of solid waste can be raised to the level it should be. The reason I am so convinced is because we have done it. It has been proven. It has been accepted.

An example. In the city of Waukegan, a city of 65,000 population, approximately, we started six years ago, amidst a lot of opposition, petitions, and very vehement opponents. We attempted to establish a sanitary landfill where there had been dumps for many years. The city council stood up and fought for what they were convinced was right. We put on a seven-month demonstration for the city. We took a piece of low ground in the heart of a residential area, joining one of the finest shopping centers in the city. With good publicity, a well-planned, well thought out program, started a sanitary landfill.

Since this time, it has been proven, we are still working in the general area. The people are actually asking to have the landfill brought to other parts of the city, to reclaim other waste property, to create more parks.

The school district bought some land which had a hill in the center with swampland around it. We have filled in the swampland around it, took the top of the hill for cover, and they are going to build a school on what was the hill and the filled area will be the recreation portion. The publicity and the education of the general public that goes with this has turned the tide of resistance to acceptance. This can be done throughout the field of solid waste.

The next part of the panel is the man you have all met, Ed Rosendahl.

MR. ROSENDAHL: Will Rodgers who was one of the great humorists and at the same time one of the most common horse-sense people we have ever had in this country, once made the statement: "The collection of garbage and the collection of academic facts ultimately present the same problem. After you have collected them, you ought to do something with them."

Both Dick and John have fairly well covered this subject and we want to throw it into an open program.

I would like to restate some of the things that have gone on this week that fit into this program very well. Many of these came in during the question-and-answer period and so forth.

In the outline I have spoken of non-professional unskilled workers being grained, particularly in interdepartmental areas -- and with citizens. Yesterday, Mrs. Rosenblum referred to one thing that is very much in the minds of everyone today. There has been a lot of money spent on the use of advertising publications, sign boards, and everything else, and the litter bug. As a result of the program to "Keep America Beautiful, Keep Mighigan Beautiful, Keep Ohio Beautiful, Keep West Virginia Green," etc., many companies including a package sewage disposal plant manufacturer put out litter bags to use in your car.

The fact remains that, as she pointed out, this doesn't go far enough. What do we do with the waste after we have collected it? This is a non-academic function of all of us, not only those concerned with public health but for everybody. It is an interdepartmental problem and it is an interdepartmental fact that the education must be endless. We have got to step across the line to our park commissions, recreation commissions that are primarily concerned with the litter bug problem.

We have got to go to our wildlife people and everybody concerned, and it is a job incumbent upon us to make these other departments aware of the fact that with this there should be some consciousness brought to the minds of people that we have a disposal problem of this litter as well.

I have lived in the southern part of the state until a couple of years ago. I lived out in the country, on a highway, and it seemed that the end of my driveway every Saturday morning, Sunday morning, and Monday morning -- because they used this highway getting to a couple of our state lakes -- was a good place after dark for dropping off that bag of beer bottles and everything else, because it would hit there and possibly burst apart and scatter, and it wouldn't look so good, but I had to pick it up. I still had to dispose of it and pay the trash man, because I paid on a percentage basis. I suppose I shouldn't say the trash man, the collector. I had to pay him to haul this stuff out with my accumulation to the disposal site.

This is John Q. Citizen's part in this thing as well.

We should make other departments within our cities, our counties, our states, cognizant of what we are doing and what is necessary to be done, and that when they develop, and bring industry in the area and so forth, they are adding to the problem of solid waste disposal.

It has been stated that we do need to consider continuing education and training in all our programs. This is not only true of solid waste, this is true of everything. We do this in the state of Ohio through our education of water plant operators, sewage plant operators. We have a licensing program.

We have surely had some wonderful headaches in the continuous education program. We do need people with something more than a little know-how because the guy with the white collar and the shined shoes doesn't want to go back and walk through the mud or grass to see that the straining device in the treatment plant is operating properly that day, or if it is a bar screen, it may need scraping, or there hasn't been a grease or sludge accumulation on the final settling tank.

I have seen any number of films on educating the man and making an image to the public which, naturally, instills a pride in the so-called garbage collector, as people like to say, that came down the street behind the truck and picked up the cans, usually in an old pair of overalls and dirty clothes. Many communities have put them in white uniforms and have created a certain amount of respect and self-respect, an image to the public, and you all have certainly helped in this.

Again, of course, in this whole thing of making the public officials conscious that this is a job, it is an important job and even though it doesn't seemingly take an academic background to do this job, still and all it is the image of the city in its relations with the John Q. Public, again.

Getting to the second phase of this, it is our responsibility, the responsibility of professionally trained people to come to consulting engineers and planners to make themselves known, and to be conscious of each other. I say this is non-academic education because it is again in the field of public relations and it is something that must go on. It is incumbent on each of us in weighing the other to consider the necessity for working together and taking these matters on an equal footing and helping each other with the technical knowledge that is contributory one to the other, which has been the entire theme of this conference.

I would like to go to this on-the-job training. That is a bug with me, being an old military engineer in the construction field and so forth, we are always conscious of how you use your plant. When we say plant, we talk about the bulldozer, the carry-all, the truck, and everything else in the plant. The operation of each of these tools is a very important thing. We talked in the service about preventive maintenance. In every program, regardless of whether we were in the midst of something or not, we arranged with the lubrication trucks and so on not to have down time, so that the equipment could be taken care of when it was not working. The lubrication truck was sent to them and they went on a regular cycle at least once on every shift. This is protection of equipment. It is a protection of dollars and cents value of that equipment to get more effective value. With it you must preach a constant program and you must take time out of the working day to conduct this on-the-job training, so to speak, for your people that are operating these vehicles and instill in them the necessity for preventive maintenance, continuous maintenance, continuous operation of your equipment. Needless to say, there are a lot of dollars in this.

Regarding landfills, I was very much intrigued with John Vanderveld's statement that they even take the engineering drawings and explain the survey stakes to the men on the dozer or the men running the trucks so that he knows what is the end result and how you are going about it. He doesn't have to be able to detail the thing, doesn't have to be able to read the blueprint, but he does need to know what is going on. This can be done. It instills in him a pride as a part of the scheme, a part of the work.

To the same extent, these sorts of things we are talking about, such as the manner of operation and so forth, what you are doing with people, should be made known to the public generally. Make them aware of what the end result is going to be, what you are going to give him, the excellent service, the good job, and something that he can be proud of.

We are talking about how the people involved in the operation of a landfill and an incinerator or any other piece of collection and disposal equipment can be educated. Of course, the last and most important is the use of mass media and visual aids. In any program of this sort, I think it is a mistake if, in the programming of it, you do not include an item in the budget for placards and other types of advertising that you can use to make the people conscious that collection of solid waste is something more than the truck going down the street, putting your garbage can on the curb, throwing it back, raising hell because he didn't put the lid back on or put a kink in the can that you just bought.

The other great means which is the hardest one to crack, if you can make news out of it, you can make the people conscious of it. That is the use of mass media which, of course, is the newspaper, television, radio, and so forth. You have got to make them understand there is a story. We have had two coverages on television this week. Mr. Robinson and Mr. Rogus were on TV Monday evening, and Thursday evening Mrs. Rosenblum was on.

There is much that can be done in this field. We in public health have the responsibility to see that things are done because this is where the laws have been written, yet within your city, all this is not within the health department, but when the place starts to stink and the rats start to run around, or the starlings come, the public health official is the one who gets the telephone call, "Why don't you get out here and stop this operation"?

We try to do this, but we don't get any cooperation. We have been stopped by the courts because we tried to close the dumps, and they say you can't do this because the community has no other place to dump the refuse. What the hell, why do anything else? We have to overcome this lethargy.

I hope all of you who have attended this conference will realize that there is an interest, a need, and a cross-section of the people that are here, the skilled professions are all found here, and it is incumbent upon us to go back, each in our bailiwick, each in our own category, to try to spread this vision further. As consultants, educators, or what-have-you, you are going to feather your own job and make it that much better if you keep plugging away.

FROM THE FLOOR: John, this is directed to you. I happen to live in the geographic area where John operates. I have been to some of John's open houses, you might call them. I have also been a suiter at heart. I was back a few days later. The place was running better then than it was when he had 200 people around because the bulldozer didn't want to run over a stupid person in front of him.

John has done an excellent job on these two models. I would like to tell you what he has done. He has upgraded his own people. He has upgraded his own collection system. Eleven years ago we had a rather crusty looking operation where I lived. Now, they are in uniform. They mimic him. They are clean. They are clean shaven. They are courteous. One of them helped my wife start the lawnmower because I don't like to cut grass, and last Saturday I had quite a pile of clippings from a hedge and so forth. It was tied up, lying at the curb. The truck driver came in the back yard and told me, he said, "Sir, I can't pick it up on this load, but I will be back in thirty minutes."

At Christmastime, we got a card signed, "Cecil and Claude," I believe it was. We didn't know who the hell Cecil and Claude were, but we found out they were the garbage men.

These men carry whisk brooms on their belts, little dust pans. If they spill something, they pick it up. If I miss, they pick it up. Sometimes I am a little sloppy. Their cans are clean.

I am not trying to get something out of John outside of someday I would like to see him construct an incinerator. We would have something worthwhile, then.

Gentlemen, it can be done. I know John doesn't like to blow his own horn, but I can tell you he has upgraded an area considerably more than just collection.

MR. VANDERVELD: You are very kind.

FROM THE FLOOR: Would the panel care to comment on a statewide certification program for disposal site operators?

MR. ROSENDAHL: I think Michigan has recently had some laws on this subject.

Fred, would you like to comment?

MR. KELLOW: This is still a debatable question as far as the committee is concerned. I don't think we will certify operators this year, but we do expect within the next few years, when we get a training program going, we will have certified operators, disposal operations.

MR. ELDREDGE: I think you realize one of the problems in certifying an operator, you must set up some minimum standards or standards of some sort. We have discussed within the last week many difficulties in operations, many differences in operations. This is going to be a problem for the first state that sets up this certification in setting up actual standards, and what you are going to require, what knowledge this man should have. Is it determined as you would a sanitary plan, the type of disposal method he has, or if he knows how to run an incinerator, is he qualified for what is usually considered a less complicated method, sanitary land fill?

I don't know of any states that have certification programs. If anybody here has heard of that, I would certainly like to talk to them personally after it is over.

FROM THE FLOOR: Has there been a survey made of the training that people in the solid waste field that are working with an incinerator or landfill, a national, countywide, or local survey, what the training of these people is, whether they could be able to absorb articles that would help them in their job such as those planning water pollution control, and so forth, whether there might be a journal for such operators. Do we know what kind of people work in these things and, therefore, what kind of training we can give them through magazine articles and that sort of thing which was mentioned here?

MR. VANDERVELD: I would like to make this statement. If someone is handling a piece of equipment and is not qualified to read the material that is necessary to train them in the handling of that material, he shouldn't be operating it.

You get to the man that is operating an incinerator, if he isn't qualified to read the material and study the material that is written on the incinerator, he doesn't belong in that job.

This goes to the man who is on the tractor. It goes to anybody in supervision, the people on the truck, and it applies up and down the scale of employees that are handling solid waste.

MR. ROSENDAHL: We are dealing in this field from all walks. When we talk about what has been done in the water field, and so forth, and in the general articles and so forth, usually we are hitting the people who are responsible, public works officials, operators of treatment plants, and so forth. Here we are talking about something that would correspond with the sewer and water situation, to the pipe layer out here who is laying the pipe in the ditch, because this is the means of collection or distribution that we are concerned with. When we are talking about the non-academic training all the way up the line, there is no doubt that this has to start at the lower level.

There is a level in here in which we need some off-the-job training with seminars, perhaps one or two or three-day seminars, such as are conducted in some of the trades.

For instance, in the Ohio Department of Health, in our Plumbing Unit, we conduct seminars for the people involved with that and the inspecting officials.

I happen to be a member of the Board of Building Standards. We are setting up a program now in order to do this with the state building officials in municipalities and counties in which we certify these areas to carry on the functions in certain states. We have to look at this thing from the smallest to the largest, and the various elements that go into it, and the degree of background education that John is referring to here as to what his skill is. When you get in the operation of equipment and so forth, you need somebody who can read an instruction sheet, or operation of a piece of equipment, or if he is in the maintenance of this equipment, he should be able to read a manual on the maintenance of this equipment, whether it is a truck or a bulldozer.

MR. ELDREDGE: It essentially boils down to the people who don't know, whether they are trainable, the people don't know and they don't know they don't know.

FROM THE FLOOR: I would like to ask Mr. Vanderveld how well established his employment is in various operations and also do you have any union problems in connection with this type of operation.

MR. VANDERVELD: We have very little turnover, actually. I can't tell you what the percentage of turnover is. I do know that in the city of Waukegan we have not had a change in personnel to my knowledge in almost three years.

In the city of Seattle where we are providing a collection service for 300,000 people we have quite a range of qualifications. Those who are least qualified, there is considerable turnover. The people who are stable in mind and family and social life, there is no turnover. We carry this throughout the organization, that if a man is able to do a good job, we pay him accordingly, and generally throughout the area where we are working, we pay more than others do in similar work. Consequently, we get far better performance. We get far better people, more qualified people, and people are willing to stay on the job and take pride in their work.

MR. ELDREDGE: I was talking to John last night and he also said that he uses the facilities of professional personnel testing for the promotion of the men on his staff. That, to me, was very interesting. It was a little further than I thought they would go in refuse collection and disposal.

FROM THE FLOOR: Many of you who might get involved in an incinerator program, it would be wise for you to recommend to your consulting engineer that he include in his specifications that the operators of the incinerator or equipment be trained by manufacturers of that equipment before they leave the plant -- before they are allowed to leave the plant, before they receive their final training.

These people are obviously very experienced in the operation of their own equipment. Generally speaking, this sort of service is not necessarily very expensive and is a part of an overall program that is usually bonded, anyway, so that you can accomplish the training program that is required without any direct expense and have it provided by the people who are very competent in their own field.

MR. ELDREDGE: I might suggest that you also get training before the plant is in operation by going to an incinerator plant of like configuration that is well operated.

FROM THE FLOOR: In our standard specifications, we include that for a certain period, depending on size, configuration, and so forth, the operator will be present and trained. The supplier of the equipment will be there for X number of days. We will be there and we will spend the necessary time in training along with the operation.

We also, while we can't write it in the specifications, we cover by letter to the purchasing agent whether they be a city, a county, or whatever they are, that their superintendent and their furnace operator be present the last two months of erection so that they can see the actual equipment going in and ask the man who is erecting it how, why, and all the rest of the questions.

In addition to that, we strongly recommend these key personnel go to a like plant for at least a week, preferably a month prior to coming into their own plant.

In that way, when you leave you feel at least that you have trained operators. Then we call back at least four times the first year to see if they are following it.

MR. ELDREDGE: Do you check the mechanical operation of the plant?

FROM THE FLOOR: The mechanical operation and the physical operation, the actual operators at least four times the first year, whether it is a sewage plant, incinerator, or anything else, because we find that if we don't check back, we will get into trouble.

FROM THE FLOOR: I should like to address my remarks to the consultant from Chicago, particularly concerning the earlier discussion. I have run across a few of these idiots myself, but I think they are motivated by the same forces we are, and usually after I have learned their viewpoint a little bit, I have found that where I considered them to be an idiot was where they disagreed with my viewpoint. After working with them awhile, I found that they may have had some good ideas and if incorporated with mine, we came out with something pretty good; but we found in our work that we have to do more than just work with these people when the job is completed, and with a few visits later on, we found the same thing.

If we do this, we come back and find things not operating in accordance with the way we anticipated them to be.

I don't know how many of you gentlemen have worked with consultants, but if you have something designed by a consultant, at first he is going to be the only man who knows how this thing is going to be operated, how he intended it to be operated, and in order to impart our view of this, we will generally write an operations manual for the use of the operator, telling him what we expect from the plant or the equipment and how we think it will be best used, together with the manufacturer's instructions. This is imparted to the operator and the superintendent in a series of meetings prior to the installation of the plant and its operation.

At these meetings, we try to imbue them with the spirit that we have that this is a great facility and that we hope they will operate it the way it is expected to be. After this training, prior to operation, we work with them during the early stages of operation and then we are on call with them from then on, and usually we visit during the early stage of operation at least once a week and then later at less frequent intervals.

As I have said, we remain on call. I have had people call me on weekends and evenings wanting some help. Being only a couple of hundred miles away from all our facilities, we are able to take care of these in fairly good shape.

These people all want to be recognized. They want operators -- no matter how low their intelligence may be, if you can implant in them the sense that they are doing something important and that their efforts are being recognized, they will exceed your expectations a great deal.

MR. ELDREDGE: I think one of the things we must do with incinerator operators -- and I suppose in the future compost operators, or any facility like this -- would be to teach these operators the importance of recognizing the capacity of the unit they have. I have seen operators who were very proud that they could accomplish 700 tons of refuse through a 400-ton incinerator.

FROM THE FLOOR: We make an outline when we are training the men and we feel it is better to write the operating manual after we learn to operate the plant.

We have a sewage treatment plant that we built on the west coast that was finished four years ago. We still have a man there. He has never left.

That plant is one of the best operating on the west coast, but we are trying to find out and also to protect the customer, we can make improvements because we are on phase three of this plant. It must be operating or we wouldn't be on phase three. This man is not a resident engineer for construction. He is out there for operation.

The maintenance manual, if you want to see one, is six inches thick. It is not made up of catalogs. Catalogs are in a four-drawer file. We put crews out there to actually operate this plant, eight different crews, and each were responsible to write up the maintenance manual.

FROM THE FLOOR: I have a question this time. I wanted to ask the gentleman if he could give us any idea of the details of landfilling the way he does it. I realize this is a specific question, but I thought perhaps you might give us a range of experience.

MR. VANDERVELD: It does vary a great deal, depending, of course, on the volume of material that is being handled and the type of terrain that you are working in.

We have, in the various operating costs a range between, I would say 30 cents a cubic yard up to over $1 a cubic yard, so it is very difficult to pick out a close enough range that would really tell a story. It depends entirely on the volume, on the problems involved in the site, the cost of land, and so on.

FROM THE FLOOR: One of the real problems of the sanitary landfills, and I don't think it has been brought out here, is that it has a way of going downhill. You go in and you sell a sanitary landfill to a community and they operate it pretty good, the city manager comes out, the director of public works, and they are interested. You go back a little later, maybe a year or two later, and it has reverted to a dump.

One of the really sad things, we just reviewed our landfills in Virginia. I think it was 25 where they had adequate area, adequate personnel, and adequate equipment, and they were operating a dump. This is a ridiculous thing, but I think fitting in with this thing, that they need to re-educate some of the people we have educated at one time.

MR. ELDREDGE: I think for any refuse disposal facility, this is true, and we have a tendency with sanitary landfills to feel the operation is so simple that we can almost let it operate itself, and it doesn't.

MR. ROSENDAHL: It is true. We speak of continuing and preventive maintenance of our equipment. This is part of the whole picture; you need a continuing education program. Once around to start something is not enough. People forget, as was brought out here. Dick Campbell and John brought out the fact that there is a turnover, particularly in the lower level.

FROM THE FLOOR: I think a lot of discussion here has been on the operators. I think it ought to be also pointed out that the supervisor over these operators needs education. I know in the state of Utah where I am from, we had a commissioner -- politician, mind you -- that lost his election, so he put himself in as road supervisor. Our road supervisors handle our disposal areas. When we go out to give stakes or something to the bulldozer operator, he dozes them over. Education to the supervisor is helpful, however.

MR. ELDREDGE: If the supervisor is properly educated, he will keep the people under his supervision busy, but if he is not, you will be in trouble.

FROM THE FLOOR: We have had several examples of people and what to do with them and about them, but so far I have not heard anything about the crews we inherit when we open a new facility. This is not solid waste disposal exclusively, but I was put in charge of a waste water treatment plant a good many years ago. The first day I arrived on the job, they assigned two people to me, one was a man who had been what they called the treatment operator. He operated an Imhoff tank and accumulated a certain amount of sludge, pumped it onto the bed and then conveniently cut a ditch off of the far corner so it would go back into the river. He also could speak no English, and in two years that I had him, I couldn't teach him to use the telephone to call me in case anything went wrong.

They gave me another man who was about the most complete anarchist that I ever saw in my life. A few months later, my wife was scared to death because the Federal Bureau of Investigation called and wanted to know where I was. She said I probably would be home soon, and they told her they would just wait outside.

She almost dropped dead while they were waiting for me to come home. This man was a card-carrying Communist and an anarchist, completely.

MR. ELDREDGE: This is a difficult problem, but I assume that the best way to start to upgrade any system like that is to try to draw up basic responsibilities at educational levels to handle this responsibility, and depending upon your political climate, hopefully, you will be able to get enough turnover to get into a higher caliber man, but this caliber of man does not exclude card-carrying Communists, as I understand it. I don't know what you do with that.

FROM THE FLOOR: One other thing I forgot to tell you, the staff only allowed two persons beside myself, and that is the way things stacked up.

As I heard the service director tell certain persons by phone, I was having trouble and was raising a lot of fuss about it, but I hear that the service director told some people over the phone that this man who was a Communist, with just a little more education, would make a superintendent.

MR. ELDREDGE: Mr. Vanderveld took over a number of facilities. Maybe he has a way of weeding out the dead wood.

MR. VANDERVELD: I think the key to this problem that you have here is something that we have talked about a little earlier, and that is education of the public officials who are determining who is going to be in there doing the work. The problem here is that solid waste collection and disposal has been pushed in the background and the importance of it has been minimized to where, in many areas, the cast-offs are put in to do the work and the function of this service is equally, if not more important, than the function of many other public works projects.

The place to start is with the people who are hanging on to the card-carrying Communist. If you have people like that, they don't belong in a service that is coming in contact with the general public, or providing a very necessary service.

This is one point. Another point is this: We have gone in many times into areas where we have taken over operations of either former contractors or municipalities that have turned it over to us as contractors. In each case, we have attempted and have committed ourselves to the public official that we would hire from the ranks of the people who were doing the work. After all, these people are being displaced and we are hiring people so we seek to hire the people who are being displaced, but what we have done is to establish a standard by which to judge whether these people are going to be hired or not. This is a very important function, as is incinerator operation or any other public works position.

If you set standards, you are going to eliminate the anarchists. If you then properly train the men that you do hire, you also will eliminate the bad habits.

In one area, we went in where a former contractor had been operating and we hired 100 per cent of our employees from the ranks of the former contractor. The former contractor went out of business because of the problems with his employees. He couldn't control them. He had three times the number of employees that he needed because he couldn't get any production out of them.

We went in and 100 per cent of our employees were taken from these ranks, but what we did was to set up a set of standards by which we would first hire them, then we brought in people to train the men we selected and did hire. I dare say that 80 per cent of the people that we hired -- this operation is five and a half years old -- were with us until the service stopped up in June. They were with us for the full five years, and performing an excellent service. Some people we transferred to other operations. We thought that much of them.

MR. ROSENDAHL: What John said in the opening remarks to this commentary is that this was a question of education of public officials. I would like to point out that many times in the preparation of a study of waste that a planner might do, that he should consider these factors and he should emphasize them in his report.

It is incumbent upon a planner when he reviews a dump or landfill to point out not only that it is an unsightly thing, not in a good location or something, but to point out the operation as it exists, and when you point out that you should have someone here, stress the manpower that is needed and all the other things that go with it.

FROM THE FLOOR: I think that one of the things all of us should try to do as we leave this conference, is ask ourselves what good we got out of the conference and what we intend to do, if anything.

This is always a difficult question to answer as we leave the conference. I think I know what I am going to do because of the particular chore that is set up for me. I am going to develop a training program in the field of solid waste. I have a pretty good idea of what I have to do and I hope to try to get this done by next spring.

Perhaps each of you have some idea of what you are going to do as you leave here as a result of what you have learned and what you have been reminded of at this conference. This is a good question to ask yourself.

I think many of you have new ideas and perhaps there is some research that should be done to further develop new ideas and substantiate others.

One of the things that I think all of us can do is follow along with this idea of education and training. I think we can all contribute something. I think everyone here is a potential teacher in this particular field. If any program is to be conducted successfully it has to be done all over to make a national picture worthwhile.

I think all these gentlemen here have contributed to the education and must do it in the future, the professors, the people who operate private systems, public works officials, consulting engineers, the planner, the health official, federal, state, all of them.

The question then arises: What other means of disposal? I can only speak, but I would like to re-emphasize for one the American Public Works Association would like to be helpful, and the extent to which we can be helpful really depends on you gentlemen, upon your request for specifics. We hope to have a training force prepared. This thing has to be made flexible, because you can see developing here, some people have very great interest in incinerators, others in other aspects. I can pick out people who are primarily interested here in general planning. Some are interested in educating the public. This course, all this training, has to be looked at very broadly and you must realize that on the local level you have got particular interests that come first and then you will follow with your other fields of interest.

I think maybe what each of us has to do is to try to work through some kind of organization in your community. I don't think one person can do it to set up a sort of a master plan of organization. What do you need? Do you first need something of a technical nature, do you need to train somebody on operating incinerators, or do you need something of a broader nature, maybe to train public works people, administrators, in a broader field, or perhaps you need public education right now.

Maybe that is the big thing. Maybe there is a bond issue in the offing.

I think what we develop here in our training course is going to have to be broad. It probably won't go too much in the field of public education, public relations, but I think we have to make it broad enough so that it will cover the areas which have been most discussed at this conference.

We have these 50 chapters of APWA scattered throughout the United States, Canada, and Hawaii. These are key people who can help you people who are planners. Get together with them. They will be liason with us if you are not a member of the APWA.

We want to work with the universities, too. We don't want to try going in alone. We don't normally operate in that respect. We need the educators.

I have had experience in this line; recently before this job, I was at the University of Missouri. I have been in the continuing field of engineering. I recently helped to conduct a course in the field of public works and construction and inspection at Kansas City. It was very successful.

This has been done, this particular course has been given, was sponsored by APWA together with a local university and other groups. It has been given many places throughout the country. We think we can do that in this case, so all you have to do is call on us.

MR. ELDREDGE: You have a serious question that is posed in there. It is asked in any number of communities. The answer varies, depending upon the climate of the area you are in.

I have been places where the governmental entity could not apparently face up to the fact and run a good operation, and private operation has stepped in and done a remarkable job.

I have been in other areas where the private entities were so interested in a profit that government had to step in and do the job. Until there is some legislation which requires a yardstick to be applied to our solid waste disposal facilities, we will have to rely upon the ability of the municipality to control their own solid waste procedures or depend on the integrity of the private operator to put out an operation which is acceptable.

Recently, in my own experience, in Region V, we have had legislation which would help to establish laws and regulations and rules for solid waste disposal in three of the five states in this, I think, what is going to be a coming trend, as it has been in air pollution and water pollution, but whether it is going to be privately operated or government operated is something that almost each entity has to figure for themselves, based on their own climate, and I don't mean the weather.

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FRIDAY AFTERNOON SESSION

SOLID WASTES AND TOMORROW

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MR. CRANE: Our speaker on the very exciting subject "Solid Wastes and Tomorrow" is Malcolm Hope, assistant chief of the Division of Environmental Engineering and Food Protection in Washington, D.C.

Mr. Hope received his Master's Degree in sanitary engineering from the University of Minnesota, a Master's in hospital administration from Yale. This fits nicely with the sanitary engineering field. He has had ten years of experience with the Minnesota State Health Department. Two of these years were with local agencies.

For the past 22 years, he has been with the Public Health Service.

MR. HOPE: Thank you, Larry. It is nice to be here today. The last time I was in Columbus, I believe it was last January or February. You had solid waste to the depth of about twelve inches on your streets.

Even after living for some 25 years in the fine state of Minnesota, I never developed a real burning interest or desire to be exposed to that much snow.

I think I am a little bit disturbed. When I came out here, the Advertising Board out in front said, "Welcome to a Solid Waste Seminar." Now I notice the Board has been changed to, "Welcome L. P. Gas Association."

It makes you wonder sometime whether someone had some premonition of a little additional gas that you might get from me this afternoon, as it relates to the general subject of solid waste ahd tomorrow.

I am always intrigued with these rather exotic titles that people try to develop for this presentation. Frankly, I am not responsible for this particular title. I am here as a substitute for Mr. Gilbertson who couldn't make it today for two reasons, one a very important committee meeting of the ASTH in the field of environmental health is being held in Washington yesterday, today, and tomorrow, and also the basic legislation in the field of solid waste on which I had hoped to have had a call by this time, in order to give you some words as to how it might be faring in the House of Congress today, was scheduled to come up on a rule from the Rules Committee. I apologize for his absence, express his regrets at not being able to be with you, and express my appreciation that he couldn't, that I am here to be with you and this is quite a pleasant change after three days in New York this week where the temperature was up in the 90s, in a non-airconditioned room at the Commodore Hotel.

I have an 18-page paper to read. You would be bored and I would be bored if I did. I have some cards which hopefully will keep me stimulated and I hope will stimulate you as well as it relates to this subject of solid waste and tomorrow.

I have a feeling that there is some little element of redundancy in the presentation, since you have already been exposed to four and a half days of detail on the broad subject of solid waste handling, collection, and disposal. I think, however, we are very encouraged by the fact that the Ohio State Health Department has seen fit to move forward with an educational program of this type. We in the public health service recognize the problem of solid waste and have for some considerable period of time.

I can go back to the days when Leo Weaver was our basic and only resource in this particular field. He is the guy that rode the bulldozer out at the Mandan project at 20 below zero to prove that you can operate a sanitary landfill under those climatic conditions.

This was back in 1950, and when you talk about solid waste and refuse and garbage, you normally went down the corridor, turned around the angle there and then very quietly, in soft tones, talked about some of the problems incident to solid waste, because this is a subject which was beneath the dignity of sanitary engineers. It was beneath the dignity of the professionals in the health field, the sanitarians weren't interested, the consulting engineering groups around the country didn't look on it with too much favor. Occasionally they had to accept a contract in the field but it was something that they did with some degree of reluctance.

Somehow, over the past 16 years, there has been a growing recognition of the problem and, finally, recognition at the federal level, by the President, and by the Congress, and we are convinced that in the very near future, we will be assisting in the mounting of a national program directed toward the solution of many of the problems that you gentlemen have been talking about for four and a half days, in the hopes that we can bring some help and assistance from the federal government into the solution of problems on solid waste that face most of the communities of this country.

This past spring President Johnson was talking about the problems of natural beauty. He expressed some real concern about the problems of solid waste and the blighting influence they are having on the landscapes of this country. He specifically, in his message on national beauty, did recommend a program of technical assistance to the state, and obviously through the states to the local jurisdictions, and also a program of research and demonstration.

I have sat in a lot of meetings on solid waste and I suppose we would have to expect this, but we talk about doing the things that we are doing a little bit better than we are doing them at the present time.

I can remember my grandmother's home, with the waste baskets in which we dumped the garbage and the other refuse, and someone reluctantly toted that out to the back of the house and dumped it into the trash can and hopefully replaced the lid, where it was then picked up by a private collector and hauled away for disposal.

That was over 40 years ago. Today we have in my kitchen a waste basket a little more modern -- I have a garbage grinder, but we have the same waste basket or one similar to the one my grandmother had, and I reluctantly, or the youngsters if we have a gun handy, tote that out to the trash can and the Washington suburban sanitary district comes in, opens the gate, empties it half in the bag that they use to transport it away, the other half in my backyard.

We are not doing as well today from my particular narrow point of view than we were doing back in the days of my grandmother. That private collector didn't smear too much around her backyard, he wouldn't have dared. Yet every six months I receive from the Washington suburban sanitary district a billing for garbage and refuse collection, water supply and sewage disposal.

The total bill for water and sewage rental charges, as they call them, run about $36 a year. The total cost for solid waste collection amounts to $42 a year. I am spending more for antiquated handling of waste that I produce on my premises than I am for such vital services as water and sewage.

Let's not just talk about doing the things that we are doing possibly a little bit better. I suppose this is a first step, but let's be ingenious and let's use some of the know-how in the technical field that we have in this country in an attempt to come up with better and new and improved methods on solid waste disposal.

Hopefully, some brilliant researcher may come up with an answer which would eliminate most of these wastes. They have packages now with frozen vegetables in them that you can drop right in the boiling water, the package dissolves and you consume the cooked vegetables after they come out of this water that contains the dissolved package. You don't have any waste material.

Maybe there are similar approaches that are available to us in some of these other areas. The problem probably will not go away.

Based on our present information, the waste production in this country on a per capita basis is increasing at the rate of four per cent per year. That is a pretty good return on investment money and it is a pretty good return on refuse.

Sometimes it is a little difficult to paint a picture so that politicians who are not as expert in this field as you are, as old John Q. Public is not an expert, in order to give them some basis for visualizing the size and complexity of the problem, say the San Francisco area. Based on some recent studies, we find, for example, in Almeda County, the per capita production of refuse is now at the level of 3.5 pounds per person per day, but in Sonoma County, also in the bay area, they are producing refuse at the rate of 18.3 pounds per person per day.

It is estimated that if all of the wastes that are produced in the San Francisco Bay area during the year 1963 to the period of 2000 -- and many of you will probably see the year 2000 -- I don't believe I will -- that you could cover a 50-mile square area to a depth of 50 feet with refuse.

A lot of people in Los Angeles think this would be a good idea, but the people in San Francisco don't take kindly to this particular point of view.

The wastes in Chicago and the surrounding six counties for one year would cover a square block to a depth of 2000 feet. That is twice the height of the Empire State Building. Yet sometimes as you talk to the politicians, as you talk to the public about the problem, they say it doesn't exist. It does. It is here. It is very real. Its solution will depend on the help and assistance of people such as yourselves who are willing to tackle the problem where we don't currently have good answers and good solutions.

You have heard the story as I am sure Ralph Black has told you on the program about the limitations on landfills, particularly in metropolitan areas, as our complexities are growing, as we are using land for other purposes, available land for sanitary landfill sites are disappearing.

As we talk about the location of incinerators, be they operated good, bad, or indifferently, people don't like them in their neighborhood. They are noisome operations and they do have a deleterious effect on property values in that area.

I am sure that they have talked to you about cost. I have mentioned this briefly. You know, sometimes when you sit in Washington and talk about dollars that are used or needed for a program, billions don't mean too much. But here, again, in translating a figure of three billion dollars a year, which is what we spend in this country for solid waste disposal activities, this represents a per capita charge of $15 each for every man, woman, and child in the United States.

I have two youngsters. My contribution on that basis should be $60. I am not going to mention this to the Washington sanitary district in addition to the $42 that they are charging me, but some of this is represented in the hidden cost of solid waste disposal represented in the purchase price of materials that we are buying in connection with our everyday living.

Why hasn't the service done more? Why hasn't the state health department done more? Why haven't a lot of other people done more?

Well, there is a problem of lethargy. There is a problem of unwillingness to tackle the problem for which we don't have answers. Furthermore, as I have traveled around the country talking on this subject, I think I have a certain inherent reluctance about telling overburdened health staffs that here is another area in which you ought to be using your personnel. For the most part, state health departments are not overstaffed. Personnel they have are working more than their 40 hours a week, but what we need are additional resources to solve the problem. Even as the public health service, in order to make a contribution, will need additional resources in the way of dollars, first, from Congress and then qualified personnel in order to carry out a program of the depths and magnitude that is envisioned in this proposed legislation which we will get to shortly.

We have done a little. The wealthiest man in our division, Mr. Henry Steed who will follow me on the program, will tell you a little bit about what we have done in some of these research areas. We have supported symposia through the mechanism of grants to environmental health sciences and engineering sciences. We had a symposium in Chicago on research needed in this field in 1963. You know, we produced a beautiful document which lists in considerable detail, useful, worthwhile studies which would give us dollars that would represent an economic return to each of us in this country.

No, it is a little bit peculiar that when you get down to a simple basic problem, like trying to rehabilitate a few square blocks in the slum area of Harlem that we can solve most of the problems of environmental health with the exception of the problem of solid waste. We were approached by the Building Research Advisory Board to support a study which involves the redevelopment and modernization of some of the areas in Harlem which is going to be financed and supported through a philanthropic organization that wants to do something for these people who are being denied, frankly -- forgetting all other aspects of the problem -- a decent place to live. They are living in homes where you worry about the rats coming in at night and chewing on the residents, particularly the infants. You know, they have ideas where they can prefabricate a kitchen, and they can prefabricate bathrooms, and they will cut holes in roofs of these four-story brownstone buildings, and they will stand these units one on top of the other and seal the hole in the roof. You make the water and sewer connections, and you are in business.

We have new and modern materials that we can use to rehabilitate the floors, the walls, the ceilings, and they will be decent places to live, but what are you going to do with the solid waste? Single flue cut-in incinerator? Double incinerators? You are dealing with a group here for whom you have to set up a procedure and technique which will simplify the method of disposition. Garbage chutes, garbage systems, we don't know, we don't have the answers. To me this is a pretty sad commentary on the current state of knowledge in this particular field, and we don't have a good answer to this relatively simple problem.

There has been a lot of talk about the political aspects of the problem. Why involve the politicians in the discussion?

I think one of the most illuminating comments I ever heard on this particular point was by Mr. Schaffer with the Northeast Illinois Planning Commission, who has been deeply involved in some long range planning on solid waste disposal in that particular area. As they have come up with proposals for locations for incinerators and sanitary landfills that have been agreed to by the sanitary engineers on the health department staff with which they are collaborating, they find that the recommendations that are being made by his group are being rather violently rejected by the unhappy residents who would be living in those areas.

He says, "You know what happens? The residents go out and hire themselves a sanitary engineer who is just as well qualified and just as competent as those with whom we have been dealing. Then we go up to the hearing before the politicians and you have one group of sanitary engineers saying one thing, another group that are saying something else. Their positions are diametrically opposed one to the other. A decision has to be made. Who makes it? The politician."

I don't mean that in a negative sense. The politician is the elected representative of the people. He has to make the decision, but, hopefully, as he makes these decisions, the professionals in the given fields will provide the basis on which he can make the proper reasonable and rational decision. I don't think we are doing that at the present time.

I mentioned the fact that we need professional manpower. Each of you, by virtue of your four and a half days' attendance at this particular course are more qualified in this field than you were last Monday morning. I heard the discussions this morning about some courses that are being set up at the University of West Virginia. I talked to Bill Ingram, Professor Ingram, from Columbia University at New York during the week. He has a course at Columbia University. They have one at Michigan. It is a required part of the curriculum in sanitary engineering, or the course in public health engineering, or the training of sanitarians? Not yet.

I think it should be and the quicker we move in that direction, the better off we are going to be. Health personnel should be qualified in as many facets of environmental health activities as possible, but this is good, the training is good. Give us time and give us resources and we can develop the training personnel that we will need to handle the job.

There is a bill on the floor of the House of Congress today under a rule given by the Rules Committee for two hours of hearing which is known as Senate Bill 306, which contains a Title 2, commonly referred to as the Solid Waste Act. Title 1 relates to amendments to the Clean Air Act. How did these things ever get tied together? It doesn't make too much sense, does it, when you talk about solid waste and in the same legislation begin to cover problems of air pollution, automobile exhaust pipes, and various other things.

Originally, the amendments to the Clean Air Act as proposed by Senator Muskie contained a provision for a hundred-million-dollar-a-year construction grant program for the construction of incinerators. His thought was that many of the problems of air pollution resulted from backyard incinerators, open-burning dumps, or improperly designed and operated incinerators that probably were obsolete and needed replacement.

As the bill was debated and considered by the Congress, the point of view has changed somewhat. I think today that Congress recognizes that we still don't know enough about incinerator design to go out and start building them at the rate of about two hundred million dollars worth of incinerator construction a year, including the matching funds from the local communities.

The bill has been amended. It was passed by the Senate last May. You have all heard the expression that the mills of the gods grind finely, and they do as you consider the problems of legislation in our national Congress.

The bill was then referred to the lower house for action. It went to the committee on interstate and foreign commerce of the House under the chairmanship of Walter Harris from Arkansas. We like Mr. Harris because he has the reputation of having never lost a bill on the floor of the House yet. We hope he doesn't change that particular record today.

There were also in the House at that time several identical bills that provided for the establishment of a national program on solid waste. There has been a growing interest in this. I can remember when Senator Smathers, about four years ago, introduced a bill into the Senate and then subsequently Congressman Lezinsky and Congressman Roosevelt jointly submitted bills. Lezinsky was indiscreet enough not to be reelected in this particular election, but Congressman Roosevelt of California -- Lezinsky was from Illinois -- and Cellar of New York, and Mr. Tingle of Michigan, all powerful, influential Congressmen, submitted their own identical bills, all directed toward the establishment of a solid waste program which provides for federal assistance in the solution of the problem.

The Senate bill has been rather substantially revised. It was revised more or less in accordance with the recommendations that came out of the administration. Hearings have been held. You would be amazed to know how much interest was generated in the support of this legislation at the time of the hearings, from outside groups.

Just to give you a brief listing of those organizations that came in in support of the solid waste bill, you had the National League of Cities, National Association of Sanitarians, American Society of Civil Engineering, the Conference of State Sanitary Engineers, the American Public Works Association, the American Medical Association -- and I do mean the American Medical Association. Strangely enough, they gave it their full, complete, whole-hearted support. Several states' health departments and other organizations too numerous to mention also supported the bill.

As far as we were able to detect, there was no opposition to the bill.

What does it provide? Two simple objectives are spelled out in Section 202. Number one, to mount a national program of research and development, including the conservation of resources and the utilization of potential resources in solid waste.

Every ton of waste is worth about ten dollars on a salvage value basis. It takes about $20 to get it out. Maybe we can effect a balance and realize some of these potential values. That is number one.

Number two. To provide technical and financial assistance to states, to local governments, and to interstate agencies in facing up to the problem.

Section 203 consists of some definitions. The only thing here of significance is the fact that the Department of Interior, through its secretary, is identified as the agency at the federal level which will concern itself with the problems of solid waste generated in connection with the extraction and processing of minerals and fossil fuels. The Department of Interior, historically, through its Division of Mines, has been interested in this and this will be reserved to their responsibility.

Section 204 provides for a very broadly oriented support of research, demonstration, training, and other activities. Here the Congress almost writes us a blank check to do the things that need to be done.

Studies of operations, new and improved methods, reduction in salvage, the publishing of information that will be useful to both the researcher, the practitioner, and the general public, and also through the mechanism of federal grants, to public, to private organizations and institutions, and to individuals -- a most unusual provision in a federal law as you will find for the most part, federal grant legislation does not get down there to the individual. Here, again, the Congress did not want to overlook the possibility of exploring every potential resource through the grand mechanism of generating answers to the problem.

Section 205 relates to the problems of interstate and interlocal cooperation. You can't handle solid waste -- I am sure you proved that during this week -- on a strictly political basis. This is a problem that does not recognize political boundary lines.

Finally, a final paragraph or section on state and interstate planning grants. These grants will be made to a single agency that has the responsibility for planning in the solid waste field to carry on surveys of practices and problems and to develop long-range plans for their solution.

What kind of funding does the bill authorize? It authorizes for the first year seven million dollars a year, the second year fourteen million dollars a year, the third and fourth years, nineteen and twenty million dollars, respectively.

This is the price tag that the Congress puts on the problem and shows their willingness to support an activity in this field.

At this point, I was supposed to be able to give you the punch line as to whether the bill has passed the House. Frankly, I don't know. We will get the word to you as fast as possible as to what has happened.

We think it is an important problem of the health service. We have been encouraged by the enthusiasm and interest shown on a national level, state level, and local levels in joining forces in the hopes of coming up with new and improved methods of solid waste handling and disposal, all of which will react to the benefit of old John Q. Public himself.

Let me say I am happy that you invited me. It was nice to be here and thank you very much for letting me.

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(Editor's Note: S. 306 was passed by the 89th Congress and became effective October 20, 1965, as Public Law 89-272.)

RESEARCH IN SOLID WASTE ENGINEERING

MR. CRANE: Henry Steed is the assistant chief of the research branch for the Division of Environmental Engineering and Food Protection, located in Washington, D. C., also. Mr. Steed received his Bachelor of Science in public health engineering from Georgia Tech. I understand that this is a degree that is no longer offered there, one of the very few graduates in this program.

He earned his Master's Degree in public health from the University of Michigan in 1958. Besides serving in the public health field, he was in the navy during World War II and also the Korean conflict, retired from the naval reserves in 1961 as a commander.

He is affiliated with several of the professional organizations that we have mentioned several times this week.

Henry has been quite instrumental in obtaining the grant which made it possible for the State of Ohio to put on this conference.

RESEARCH IN SOLID WASTE ENGINEERING

By: Henry C. Steed, Jr.
Assistant Chief, Research Grants Branch
Division of Environmental Engineering
and Food Protection
Bureau of State Services
Public Health Service
Washington, D.C.

Program of the Division of Environmental Engineering and Food Protection

The basic mission of the Division of Environmental Engineering and Food Protection is to provide consultative and technical assistance to state and local health departments, other state and local agencies, universities, and public and private agencies and organizations in planning, developing, and conducting a broad program in the area of environmental engineering and food protection. Through the five branches of the division, programs are conducted aimed at improving and protecting the general health and welfare of the people of this country through a variety of environmental measures, particularly those related to milk and food, the control of environmental sanitation on interstate carriers, shellfish sanitation, metropolitan planning for environmental health, solid waste disposal, swimming pool sanitation, plumbing, and general community sanitation.

The accomplishment of these broad program missions require three specific activities: (1) the identification and assessment of environmental problems; (2) the development of control methods; and (3) the application of knowledge obtained. These activities require an overall approach utilizing both basic and applied research, technical consultation, training standards, development and demonstration, and control procedures.

The Role of Research

The research effort of the Division is of great importance in supporting and supplementing its program efforts through two types of research activity, the intramural program and the extramural program. The intramural program is concerned with research generally conducted or directed by the staff of the Public Health Service such as the work now being carried out in the milk, water, and food field at the Robert A. Taft Sanitary Engineering Center, as well as a limited amount of directed contract work. The extramural program involves support to individual investigators in universities or other institutions for non-directed research and is generally known as the research grants program.

Within the organizational framework of the Division of Environmental Engineering and Food Protection, the Research Grants Branch has a basic mission to strengthen research in the area of the Division's responsibility. This involves support of studies in the social, biological, physical, engineering, and medical sciences, particularly as they deal with the health aspects of man's relationship to his environment. The Branch at present administers a program of extramural research through colleges, universities, other public and private institutions, health agencies, and individuals.

How Research Projects Are Reviewed

Research grants are often referred to as "non-directed" research in that the research idea is originally conceived by the investigator, and if appropriate, submitted to the Public Health Service for its appraisal and possible support. In awarding research grants, the Public Health Service makes use of consultative groups of distinguished scientists. These groups, organized as study sections, review proposals submitted by eligible institutions on behalf of named investigators and provide objective appraisals of their scientific merit. In the case of proposals within the program of the Division of Environmental Engineering and Food Protection, these appraisals are reviewed by the National Advisory Environmental Health Committee which makes the final recommendation for approval or disapproval. Only proposals which are recommended for approval may be supported by a grant.

Current Research in Environmental Engineering and Food Protection

At the end of fiscal year 1965, the Research Grants Branch of the Division was supporting 248 grants totaling more than $4,800,000.00. These grants included 45 in support of environmental engineering research including solid wastes collection, storage, and disposal; individual sewage disposal; housing hygiene; urban environmental health planning; water quality related to drinking water, shellfish and marine food growing areas and recreational uses; and institutional sanitation. There were 83 projects in support of microbiology of foods including milk and milk products, marine foods, and general microbiological studies relating to foods. There were 64 projects supported in the area of the toxicology of foods including pesticides, naturally occurring toxins, and other food chemical contaminants. There were 56 projects active in a general area of chemistry and technology of foods, including the composition and methods of analysis as well as processing and equipment.

Current Solid Waste Research

At the present time there are 15 active research projects with a level of support of $455,899 in the solid wastes field being supported by the division.

These projects relate to several areas of the solid wastes field including studies of municipal landfill operations, incineration, and pyrolysis. There is one study concerned with the systems analysis of a total municipal operation. One study of shipborne incineration is exploring a new and somewhat unique approach to disposal. Several studies are concerned with farm wastes, particularly animal wastes, and one is concerned with cannery wastes.

There are currently 8 active grants dealing with municipal waste. They are as follows:

EF-00040-03	Sanitary Landfill Investigation	Burchinal, J.C. Univ. of W. Va. Morgantown, W. Va.	$29,374

This work is concerned with identifying groups and numbers of organisms which are active in aerobic and anaerobic refuse decomposition. The rate and composition of gas production and effect of nitrogen, phosphorous, and potassium on the rate of refuse decomposition is being studied. Basic chemical and bacteriological data will be obtained on landfill seepage in streams and wells in the vicinity of the fill operations.

EF-00160-05	Factors Controlling Utilization of Sanitary Landfill	Merz, R.C. U. of So. Calif. Los Angeles, Calif.	$20,970

This research is aimed at maximizing the refuse disposal capacity of landfill sites. By regulating the moisture content the investigator has shown that in place density may be increased by as much as 35% if an 18 foot lift is used in lieu of the conventional 4 foot lift. Studies on the live load effect on compaction within the sanitary landfill are being continued.

EF-00355-03	Mathematical Simulation of Refuse Collection and Disposal Systems	Charnes, P. Northwestern U. Evanston, Ill.	$18,476

Computer techniques are being utilized to develop and perfect a mathematical model to simulate the collection and disposal of refuse. The model will give an optimum solution to the problem based on consideration of direct cost factors and pollution levels to be expected. It is also expected to achieve delineation of performance standards which any new procedure or process must meet in order to achieve maximum efficiency with a minimum of cost and pollution.

EF-00530-13	Pyrolysis of Municipal Refuse	Kaiser, E.R. New York U. Bronx, N.Y.	$12,120

It is proposed to determine the nature and quantity of the volatile matter from pyrolysis of refuse constituents of varying compositions. From the data it should be possible to calculate the possibilities for gasifying refuse to produce raw hot combustible gas for boiler firing. The data may also be used to aid in design criteria for optimum refuse burning, with reduction of the volumes of flue gas to be cleaned of dust before discharge to the atmosphere.

EF-00710-01	A Study of Incinerator Residue	Purdom, P.W. Drexel Inst. Tech. Phila., Pa.	$56,699

This project will study the utilization of ash from incinerators as cover and fill material. It includes the classification of ash into its chemical and biological components, a study of fly breeding and odor production, as well as other factors that may limit ash usability.

EF-00735-01	Systems Analysis for Shipborne Municipal Incineration	Silverman, L. Harvard U. Boston, Mass.	$96,450

This study is devised to explore the feasibility and environmental effects of shipborne incineration. Included are such factors as production and distribution of air-borne pollutants, characteristics and effects of incinerator ash on the marine environment, and cost analysis of such a system.

EF-00746-01	Pyrolysis of Solid Municipal Wastes	Hoffman, D.A. San Diego, Calif.	$25,146

The application of Pyrolysis (reduction) to municipal refuse on a laboratory scale has yielded elemental carbon, tars, resins, gases, and various pyroligneous acids. It also indicated a very considerable reduction in volume of the solid residue to handle. This operation will be applied on a larger scale for more truly representative results. The pyrolytic products will be quantitated and carefully analyzed and the commercial possibilities of these products explored.

EF-00698-01	Continuous Incineration of Municipal Refuse	Kaiser, E.R. New York U. Bronx, N.Y.	$50,433

The purpose of this project is to obtain test data and data analysis from the latest design of an operating plant with continuous furnaces. The plant is to be thoroughly instrumented for measurement of input, output, temperatures, velocities, dust loading of the stack gases, and chemical analysis. Heat and material balances are to be obtained. The plant to be studied is the Oceanside Refuse Disposal Plant of the town of Hempstead, Long Island, New York.

There are 6 projects currently active related to industrial and farm solid wastes including canning operations in the food industry, agricultural wastes including animal waste problems, and vector control projects related to animal wastes.

EF-00108-02	Composting Fruit and Vegetable Refuse	Mercer, W.A. Nat'l Canners Assn. Berkeley, Calif.	$27,599

This project is studying the use of composting for disposal of food processing wastes. It has progressed to the stage where it has proven the feasibility of the process and is now beginning a pilot scale development study.

EF-00410-02	Handling, Treatment, and Disposal of Animal Waste	Hazen, T.E. Iowa State U. Ames, Iowa	$21,913

The objectives of this study are to determine the physical, chemical and bacteriological characteristics of animal manure. Further aims are to devise and test economically feasible methods of rendering the manure safe from the standpoint of human and animal health protection.

EF-00454-03	Integrated Control of the House Fly	Axtel, R.C. N. Ca. State Col. Agric. & Engrg. U. of N. Carolina Raleigh, N.Ca.	$ 6,076

The specific aims of this research are to: (1) determine the effects of insecticides on manure inhabiting mites and (2) determine the factors affecting the behavior of the macrochelidae, with initial emphasis on phoresy. The effects of various fly control techniques on the manure inhabiting mites will be investigated.

EF-00515-02	**Succession and Ecology of Diptheria in Cattle Droppings**	**Anderson, J.R. U. of Calif. Berkeley, Calif.**	**$11,392**

The basic aim of this project is to ascertain the factors which determine the chronological appearance of different fly species on and in cattle droppings of various ages. Studies will be conducted under both undisturbed pasture and experimental conditions. The effects of either or both inter-specific competition will be investigated by experimenting and manipulating the habitat to either eliminate or increase the numbers of those species attracted only to droppings of certain ages.

EF-00525-01	A Study of Farm Wastes	Witzel, S.A. U. of Wisconsin Madison, Wisconsin	$32,700

This project is a study of farm wastes in changing agriculture to determine the character, economic value, and any adverse effect they may have on public health. Methods of livestock management which affect the character of the waste and methods of ultimate disposal from lagoons as well as the lagoons themselves are to be investigated in order to develop reliable design and operation criteria for waste disposal.

EF-00541-01	Microbiological Stabilization of Animal Wastes	Berry, E.C. S.D. State College Brookings, S. Dak.	$22,482

Development of bacterial stabilization for livestock wastes is sought. Through laboratory procedures it is hoped to obtain basic data needed for criteria involved in the development of processing equipment to convert this material into a harmless state. These methods would be of great benefit in areas where water shortage or low temperatures preclude the use of sanitary stabilization lagoons.

Solid Waste Research Conference

The following project was recently activated:

EF-00804-01	National Conference on Solid Waste Management	Hart, Samuel A. U. of Calif. Davis, Calif.	$24,069

This is research support for a nation-wide conference to appraise, evaluate, and give direction to a new concept of solid wastes management. The conference is to be built upon the December, 1963

National Conference on Solid Waste Research but is to take a new path aimed at solution to the solid waste problems in the coming years. The conference is proposed for April 6-7, 1966 on the Davis campus of the University of California. It is expected to attract more than 800 professional workers from governmental agencies and private industry.

Research Needs in Solid Waste Engineering

We have only begun to scratch the surface of needed research in the solid wastes field. There are many challenges in fundamental research for those who want to probe the basic mechanisms of the various aspects of solid waste. There is a great need for biological and chemical research in composting, in sanitary landfill, in collection and storage mechanisms, and in new treatment methods which have yet to be devised. There are many challenges in applied research for those who want to find immediate solutions to today's problems. These needs encompass biological and chemical processes as well as sociological and political problems. There is a need for a great deal more research in systems analysis, in instrumentation, and in equipment design. The problems of solid waste are far from having been solved.

Training Grants in Environmental Health

The Public Health Service offers a variety of training grants to meet various needs for supplying scientific man-power in the fields on environmental health. The training of technicians and specialists in the solid waste field is a highly important one. There is no academic program existing today for training engineers or scientists with a specialty in solid wastes engineering.

The Research Training Grant program of the Public Health Service offers support to universities for faculty, equipment, tuitions, and student stipends, for the purpose of training researchers and future teachers. The Project Training Grant program provides support for developing new or strengthening weak programs in the various specialties in environmental health by providing faculty support, equipment, curriculum development, etc. The Environmental Health Traineeship program provides block grants to universities for support of students in various environmental health programs. The Short Term Training grant is designed to provide student support to non-academic specialized short courses and seminars. If we are to solve the many problems that face us in this field, we must provide for academic programs to train all levels of students in the scientific and engineering aspects of solid wastes engineering and management.

The scientific approach to solving the complicated problems relating to solid wastes is considered to be at a level comparable to the "middle-ages." New knowledge on handling, transporting, storage, and above all treatment and disposal must be obtained, the answer to which is more and better research. This further calls for training of researchers and technicians, thus there is a growing need for technical training programs, both on the academic, as well as continuing education level.

RESEARCH IN SOLID WASTES ENGINEERING

DISCUSSION

MR. HOPE: This is research support for a nation-wide conference to appraise, evaluate, and give direction to a new concept of solid waste management. The conference is to be built on the December, 1963, national conference held in Chicago. Although a new path aimed at solution of the solid waste problems in the country for the coming year is being taken, the conference is proposed for April 4 and 5, the Monday and Tuesday before Easter. This is on the Davis campus of the University of California. Sam Hart expects about 100 people. I hope he gets them. If any of you are interested, please write to or contact Dr. Sam Hart, University of California, Davis.

MR. HART: I want to point out that I will send personal invitations to everyone who is on this training list whose name is on this roster.

MR. HOPE: Just a word, but a brief word, on the research needs in the solid waste field as we see them. Much of this has been brought out in this conference by other speakers. We have already begun to scratch the surface in this field.

This half million dollars which we are putting into this I hope should be only the first drop in the bucket to a bigger and a better program. There are many changes in the fundamental research for those who want to probe the basic mechanisms of the various aspects of solid waste. There is a very great deal of need for biological and chemical research in composting, in sanitary landfill operations, in collection and storage mechanisms, and in new treatment methods which have yet to be devised. There are many changes in applied research and many challenges in the basic field. These needs encompass biological and chemical processes as well as sociological, legal, political, approaches. We must do more research in systems analysis on the problem. There is a great deal more research needed in instrumentation and laboratory methodology, and particularly in equipment design.

The problems of solid waste are far from being solved in this country, and I think the only way we are going to do it is through research.

We are faced in the research grant program in intramural research program and all research programs, particularly in the field of solid waste, because of one factor: We do not have enough trained research personnel who are interested and stimulated and motivated to work on this problem. We must have more. This requires training.

It has been my experience in working with the research grants that most researchers who go through the university to get their Ph. D. are formed in their careers early in their Ph. D. life, or in their student life. A lot of times they go out when they are interested in work on the thesis subject. Later their interest is narrow and they follow this narrow path through most of their lives. Good training programs with strong emphasis on solid waste is required and is needed in order to motivate and to train future researchers to do work in this particular field.

You have heard that it is not appealing, it is not appetizing. We hope with the new grants mechanism coming up, with the new grants program coming up, providing the bill is passed, that we will have at least some stimulus and better financing for student support.

I would like to dwell a moment on the four basic environmental health training grants that exist in the Public Health Service today. This is number four of the bill.

The research grants training program which is the program aimed principally at the Ph. D. level student is available through the environmental sciences program, through the office of resource development. It is available for the support of training in solid waste. It provides for staff support, equipment, travel, supplies, other things needed to establish and develop the program and in addition, stipends and tuition for student support. It is for training researchers and should be considered a Ph. D. level type of program. We do not have a program active in any university in the solid waste field other than on the Ph. D. level or Master's level today, at least to my knowledge, we don't.

The next two types of grants can be referred to as Master's level programs. They have existed for some time for sanitary engineers and other aspects, but they can be used for solid waste. The first one is a project training grant which is funded from Section 309 funds of the Public Health Service Act, and provides for institution support only, staff, equipment, travel, and what-have-you. Principally, the purpose of this grant is to strengthen weak programs or develop new ones.

A companion grant to this one would be the environmental traineeship grant which would provide a grant for student support, tuition, stipend, and a limited amount of travel. These two grants are often used together, one to supply the vital support, the other to supply student support.

The fourth one that I would like to mention that exists today is a short-term traineeship grant which is funded from Section 306 funds of the Public Health Service Act. This is the type of grant that is supporting the program which you have here today. It is non-academic. It is for support of continuing education efforts. It provides student support from the standpoint of providing tuition which is used by the grantee to support the course and it also provides for per diem at $12 a day which I am sure you gentlemen are aware.

These four programs do exist today. Of course, they are limited due to the limitation of funds, but they are available for use and we urge that you keep them in mind.

Under the new act, Senate Bill 306, for the first time in the history of our division, we will have funds earmarked for training. We have discussed this in staff. Nothing has been formalized and it is all in the planning stages, but it will provide for support at the academic level for programs in solid waste. The plan is also to provide a limited amount of fellowship support to individuals desiring to be trained in certain specialized existing programs in universities today, and I am sure there will be continuing support for this continuing program of education, short-term efforts.

We hope that in a few weeks we will be able to talk more specifically along these lines.

In summary, I would like to point out that the scientific approach to solving the complicated programs of solid waste is considered by most of us who have worked with the research grants and the researchers to be at a level comparable to what it was in water pollution about 25 years ago. In other words, we are still in the Middle Ages on this program. We must promote enthusiasm, we must motivate researchers to move in this field. I think it is a wonderful opportunity for the young researcher to get support and to work on a rewarding problem.

We must train more men. It is our job in the Public Health Service to provide the support through the grant mechanism to these support operations.

Keep in mind as I mentioned before we do not guarantee or promise the money under a grant. We are available in our office to work with you in the design of a project, in the writing of an application. If you would like, we would be happy to review any draft that you submit to us in Washington and I am sure that in the solid waste program that I will be visiting many of you in the next few months, working with you, trying to get better projects on the books.

I appreciate being with you. I know there are often questions you would like to ask about grants programs, so I think I will cut off at this moment and see if there are any questions about any details of the problem you might have related to the grants program.

FROM THE FLOOR: Have you published results of these various programs to date?

MR. HOPE: We urge through the grants program -- we do not require the publication, but most researchers do -- most researchers find their livelihood is publication. Many are published in the leading journals related to the subject matter concerned. I would suggest that if you want information about any particular project listed that you write directly to the investigator. They are usually very cooperative in providing information, but they are published.

FROM THE FLOOR: In the 88th Congress, there was a bill which died in committee. I don't remember the number of it or the author. It provided for $35,000,000 to be spent on seven pilot plants throughout the country. Is any of the features of that bill contained in Senate Bill 306?

MR. HOPE: Yes, but not at that level of support. Senate Bill 306 does provide for demonstration grants including construction. The government is to provide 75 per cent of the construction funds.

FROM THE FLOOR: Is there a provision in 306 to provide contracts?

MR. HOPE: We have the authority for contracts now. The problem is that we don't have the money. Remember, now, you get the bill and then you have to get the appropriation to carry out the authorizations of the bill. The contract research mechanism has been a very good one as far as developing research projects that are really on the program. If you look in the special agenda, we do have some degree of latitude in getting studies going on particular type problems, and we are charged with coming up with the specific programs.

The contracting authority is there. Hopefully, the dollars will be made available.

FROM THE FLOOR: I would like to ask whether -- you have here the active projects now, financed by your department. There are eight municipal. I would like to say there is a good comment that the people work on animal waste -- I am just wondering -- if we can find out something more about these two projects. Is this because you do not finance anymore, is it that you don't have enough applications?

MR. STEED: It is the latter. We don't have enough applications. This has been one of our big problems in solid waste programming. That is, getting good competent researchers who are interested in working on the problem.

You can count them on your hands, I think, most of the people that have had any experience in the country. I would say it is the latter. We have been limited on funds, but we have never failed to fund a solid waste project because of lack of funds yet. We have some others, but not solid waste.

MR. HOPE: Mr. Steed, I have the feeling sometimes that we over-emphasized the fact that research is to be carried on in academic institutions by people who are working on it, who have it done.

I remind you, and this is something on which we have failed miserably in the Public Health Service, of trying to generate research projects utilizing the talents and abilities of people that we have working in state and local health agencies. This is not limited only to the academic class.

If you can come up with a good research project and you are competent to carry it on, I don't think you need a Ph. D. to do it. We can look with great favor on applications of this type.

MR. STEED: Well, I will call to your attention the fact that we do have one project, a very excellent one, carried on by -- I don't know what his degree is, but he does not have a doctorate, Mr. Hoffman, laboratory director for San Diego Public Works Department.

I would like to add to that, Mr. Hope, I think for clarification more than anything else, we do support several projects in state health departments and in non-academic institutions. Let's put it that way. The main difficulty in supporting research in an operating agency, I think we should face squarely, and I think it is a sort of a disgrace that we in operating agencies don't put more emphasis on research, most operating agencies do not get into the research field for several reasons. No. 1, they usually don't have the people on the staff that have had research experience or training. Some of them do, but most of them don't. They will not devote the time to it and it does take time to do research. In other words, if a man on an operating unit wants to do research, he does it on his own or squeezes it in when he can. This is not good for research.

Thirdly, most of our operating agencies will not put the money into the operation to carry out research. It does take some money to do this.

We have good research going on in some agencies and I think there is a definite role for certain types of research in some operating agencies.

I do think that you people who are in operating agencies should consider cooperative effort with the university. We have several projects in other areas -- well, even in this area.

The project at Drexel on incinerator ash is a joint project between the Drexel Institute, the city health department, and the Public Works Department. This is a way to get good research done.

FROM THE FLOOR: Would you, if you have the time, outline the procedure in a grant application and what steps it goes through?

MR. STEED: All right. I touched on that very briefly, but I will give more detail. We have a definite form for the submission of a research grant application. We ask that anyone investigator use this form for one specific reason. There are some average of 3000 applications around that come through the Public Health Service. Our consultants don't want to be reading different formats. It makes the job easier if they can read the same type of format on the applications.

You submit an application to the Division of Research Grants at the National Institute of Health, on the prescribed form. There are three deadline dates a year for the submission of applications. The next one is October 1. The next one following would be February 1, and the next one following that would be June 1.

You should always allow yourself six months' lead time before beginning the project because it usually takes anywhere from four to six months to process, get reviews, and to handle the application.

Let's go through the sequence of one that would be submitted, let's say, on October 1. This would be reviewed probably sometime during the month of January or early February by a study section. This is the primary review.

The study section looks at this from the standpoint of the merits of the application, the methodology used, the competence of the team that is doing the research, the scientific merit is important. They do not consider policy matters.

Then, they will recommend the application for either approval, disapproval, or in some cases deferral. If additional information is needed or they may want to visit the institution, they will rule it a deferral.

The application then goes to a council. We call it the Economy Council. It is a national advisory environmental health committee. The committee that will consider the applications will meet next March, usually about the middle of the month. What this means is that an application that is submitted October 1 or about October 1, and is approved by the committee in March, can be funded -- if the money is available, of course -- April 1. You have got about a few months' lead time, again.

That is the process by which an application goes in.

The Public Health Service does not tell the investigator what to do and how to do it. This is non-directed research. The researchers conceive the idea and carry it out themselves. If the council approves it, they will support it.

FROM THE FLOOR: What is the study group consisting of? Are these public service people?

MR. STEED: These are independent scientists. The study section is made up of many, many different people. At the present time, there are 52 or 53 study sections active in the health service, over 600 consultants involved here. The applications will go to a study section that is considered competent to handle it, that has the people on it that are competent in the subject you want to investigate. These people, for the most part, are university people. They are not public health service people. They have been selected for their competence, but they are independent scientists. We do not use public health service people except in very rare cases. I do know of a couple of cases where this is done, but this is rare. The council is made up of not just scientists, there are scientists on it, but there are political leaders, community leaders, leading people in the country, really, who make up the council.

For example, our environmental health committee has the Chancellor of one of the universities of California, for one. It has the president of a city council or a county council -- Mr. Connors of Detroit is on the council. People like this, Deans of schools of public health, health officers, et cetera. This is how the council is made up. They are also non-public health service people.

FROM THE FLOOR: What did you say the level of support for such programs was?

MR. STEED: Well, when I used the term "level of support," I get this figure from what this year's budget is for the project. In other words, what we have put in it for the current year. The level of support for the solid waste at the moment is $455, 899.

That is for 15 projects. Incidentally, these research projects that I discussed with you this morning run at the level of about $6000 up to the largest one which is, I think, about $96, 000.

FROM THE FLOOR: Would the Public Health Service be interested in inter-disciplinary studies, collecting the skills or the scientists and studies that have been made into one, let's say, comprehensive analysis for a practical use?

MR. STEED: I would have to know a little more about that. I am not exactly clear what you are getting at. Certainly we are interested in supporting inter-disciplinary research. I think most of it is that way.

FROM THE FLOOR: Let me rephrase it. I wonder if it would be better for financial reasons and for strategy reasons to apply for a planning -- in effect, a planning grant through the 701 program, or through this research program as it might apply to a specific community.

MR. STEED: Well, if it were truly research in the accepted sense of the word of a scientific index, I would say it would be a proper research grant. If it is a planning grant, the research program could not support it.

FROM THE FLOOR: What is the procedure for renewal or extension of a grant if the project needs further work?

MR. STEED: When an investigator designs a research grant application or project, he designates it for whatever period of time he thinks it will take, not to exceed seven years, that he feels is necessary to do the work. In other words, we do have a limit of seven years on an initial application.

Our applications range anywhere from one year in the case of a conference grant up to as high as seven years. Some are still active at eleven years.

If it is approved, let's say, a research project is approved for $25,000 a year for three years, then there is no further action other than to submit a new budget page each year, a new budget page, and a summary.

We commit three years to the project when it is approved if it is approved for three years. If at the end of three years the investigator feels that he needs an additional time, he submits another application just as it was -- just like a new one which we complete for a continuation for additional support. This goes through the review process.

In other words, if you are approved for three years initially, you do not go back for review until the end of that three years if you want additional support.

It is also possible under the program, once you start a project, if you find you need additional funds and can justify it, or equipment, or something like this to make a better project, you can submit additional applications for such a supplement to the project, over and above the funds already previously approved.

Let's not all go out and draw up a research grant application, but if I can help you, we will be happy to look them over, discuss them with you and we will be as honest as we can on whether it will succeed, because we don't want you wasting your time writing up an application which is no good. It takes an awful lot of work, as anyone knows who has written up one.

SUMMARY AND COURSE CLOSING

MR. ROBINSON: I am at a loss as to what to say. There has been a tremendous amount of work gone on in preparing this course and putting it on. We have had a great deal of cooperation from other divisions within the department, and one hell of a lot of help from Larry Crane.

Now that it is all over, looking back, I think it has been a little fun.

To start us off Monday morning, we heard from George Eagle, and I think he will close us off.

MR. EAGLE: Thank you, Robbie. I get to give the invocation and the benediction.

Robbie didn't feel that his vocabulary would permit him to do this.

He said I didn't need to say much of anything in the summary remarks, and then he proceeded to refer a newspaperman to me who asked me for my summary, so he fixed me up in pretty good shape.

Needless to say, you don't get much of a summary because I have some very rough notes.

I certainly want to commend all of you gentlemen for your interest, your attentiveness, your participation and your patience this week. I think it has been very wonderful.

In talking with a number of you and hearing comments, I haven't heard anything but favorable comments, and very complimentary remarks about this course. I think this is a little unusual because knowing many of you as well as I do, I know if this were not true, you would certainly express yourself otherwise, and for a group as large as this and as diversified as this, I think this is certainly a remarkable display this week of staying right on the ball.

I couldn't attend the entire conference here, so my remarks and comments are going to be limited. I, however, did receive some comments from others and I have included them here. These are what I have more or less written down as capsule observations. I am not going to make an attempt to try to summarize the entire conference this week. This would be impossible and it would certainly be very repetitious.

I noted from some of the questions that were asked here and from some of the barroom conversations and the room "conferences" that the public health representatives and the county and the city engineers seem to be primarily worried about how they were going to get people interested and get something started in their communities back home to meet this solid waste problem.

In other words, how are we going to motivate people? The planners seem to be concerned with training this regional or overall program for a large area, so many people. The consulting engineers seem to be concerned about the facilities, the details of designing the facilities, and the university professors seem to be worried about how we are going to get a federal grant.

Of course, they are worried about other things, too, and we had many good comments on that.

It was amazing to me the publicity we got on this. Our public relations man in our department said, "Oh, no one is interested in solid waste." Much to his amazement and our amazement, everytime I turned on the radio or the television this week, or read a newspaper, there was solid waste all over the place. I don't know who is responsible for arranging all this, but it certainly was well done.

I think the speakers did a fine job, the ones I heard, of defining and improving the problems of solid waste, the technical explanations of the need of research were well presented.

The basic planning for the overall program was certainly well presented. The speakers emphasized the need for cooperation across political boundaries, the need for a master plan, the need for appropriate legislation, the need for proper financing methods, the need for public education, and certainly the need for research.

The questions from the floor indicated that many areas are making good progress toward solving their solid waste problems. Questions also pointed out the number of stumbling blocks to be removed.

Education of the expert as well as the public will help in this effort.

I have just a few quotes and conclusions that seemed particularly appropriate to me and these are not intended, as I have pointed out, to be all inclusive.

These are just highlights as I noted them down here in no particular order. It said that the problem is more political than legal, financial, or technical.

Political leaders? There is a vast difference between leading and being pushed. The problem is people and the quality of living they desire.

In the matter of solid waste, the voice of a citizen is usually negative as it was in the matter of sewage disposal a number of years ago.

Local government is where the action is and the federal government is where the money is.

Solid waste problems should be tackled and solved on a self-supporting utility basis. I think this is very, very important, and very appropos.

Master planning is essential.

Advisory committees can be helpful.

It takes a good worker to use good tools. If you don't believe it, put a fine tool in the hands of an incompetent, disinterested worker.

Should the states certify workers and supervisors at solid waste facilities?

We can't assume what is true in one place holds true in another. You should study your problem in detail and have it computed to each and every community.

We live in rapidly changing time, changing loads, characteristics, changing attitudes, changes in design, changes in equipment, and changes in people. We must keep up with that rapidly advancing time and changes in solid waste programming.

The solid waste program in a nutshell: Motivation, planning, design, construction, operation, in that order.

We can design foolproof incinerators and good landfills, but we can't have them operated by fools. I changed that to "incompetents." It means the same thing.

How do we inspire, recruit, train, and hold personnel in solid waste organizations? This is the $64,000 question, no question about that.

Do people who don't know, know they don't know? That was brought out a number of times.

More well trained personnel at all levels is a must if this problem is to be met adequately.

There is a lack of thinking and research on entirely new concepts, too much attention is given to minor aspects of the old solutions.

There is a lack of scientific approach to cheaper and better methods.

If you are going to get into the problem, you had better roll up your sleeves and prepare to follow through. Public awareness without professional guidance may do more harm than good. Follow-through for longer periods of time is an absolute necessity.

I believe it was concluded that unity and coordination among all agencies and groups must be attained. This will take a unique balance of education and enforcement which has yet to be developed on a regional basis.

It was pointed out that there is a need for many more conferences of this type and other types, meetings at the regional and local levels, and we hoped that this would be the beginning of widespread educational and training programs in the matter of solid waste.

We are certainly very happy to have you all here. We enjoyed having you. We were very glad that Ohio was chosen as the place to hold this important conference and, believe me, we are going to do everything in our power to make use of all the information which has been made available to us here this week, and we hope that in the not-too-far distant future we can repeat something of this type.

Robbie, I turn it back to you.

MR. CRANE: I intercepted Robbie on this. I hate to make it appear that the federal government has the last word, but I have some important things to go over, I believe.

I think we all owe Mr. Eagle, Mr. Robinson, Mr. Rosendahl a great deal for the work they put into this course. It has been a lot of hard work for them, I know. I watched them struggling with this and they have come up with a real good package, I believe.

Do you have anything you want to add before we adjourn? If not, it has been a real pleasure. Have a nice trip home. I hope to see you real soon. (Applause)

- - -

APPENDIX I

Master Refuse Plan
for
"Our" County

- a hypothetical problem -

Technical & Planning Aspects
of Solid Wastes

- a short course -

Nationwide Inn - Columbus
September 20-24

Ohio Department of Health
U. S. Public Health Service

Master Refuse Plan

For "Our" County

Workshop Session September 22

THE SITUATION

This, Our County, is rapidly becoming urbanized due to its proximity to a very large city in the adjacent county. True to form, there are municipalities about the metropolis, although small, desiring to maintain their autonomy and reluctant to enter into any joint operation with the metropolis. Because of their proximity to our county their solid wastes problems affect our overall planning.

At present the western portion of Our County is almost completely urbanized and is indicative of the future in the central and eastern sections of Our County.

In the past 10 years, the western portion has increased 150% in population. Gross density increased more than 200%. The growth rate in the eastern portion is predicted to match this in the very near future primarily due to the completion of two major freeways passing thru the county. From the metropolis to the largest city in the north central portion of the county, the time-distance travel will be 30 minutes, and less than 45 minutes to the most easterly interchange of the Interstate #1.

The volume of garbage and refuse is in direct ratio to population and density throughout the county. Per capita volume increase is comparative to the National Average.

For the purpose of this study the county is divided into two areas roughly equivalent to the population densities. Figure 1 indicates these areas.

Figure 2 indicates the volumes of refuse and garbage that will be generated daily within the two areas. Increases are based upon 3 pounds per capita times the population estimates projected.

The planning commission and the county authorities and many of the political subdivisions are interested in a disposal program at county level.

Table 1 indicates present volumes of residential wastes and Table 2 of industrial wastes. By 1985 it is expected that the volumes will increase to a total of 565 tons per day or over 206,000 tons per year.

Because of the geohydroligic environment of the county bordering on the lake, the terrain elsewhere, pollution controls, and economic factors, only two means of disposal have been considered feasible, incineration and sanitary landfill. Some of the industrial wastes produced in the region are not disposable by either of these means but for the purpose of this report are not included.

Some of the communities are presently operating under a program that is satisfactory from the cost standpoint. Present facilities will shortly reach their capacity.

Figure 3 indicates the existing disposal sites. Note that only 3 of the sites accept both garbage and refuse. The eastern end of the county presently has no facilities for the disposal of garbage.

See Figure 4.

Four municipalities require either garbage grinders or an incinerator in all new residential construction.

Village "I" has the only incinerator but at present it is not operating.

City "B" uses the incinerator in the next county.

Village "I" and City "A" have no landfill site available other than the one in use.

Landfill sites are presently operated by individual municipalities and townships.

Tables 3, 4, and 5 indicate some of the data collected by questionnaire.

There is a problem of air and stream pollution from an industrial concentration in the north central part of the county.

Sewage and sewage treatment facilities in some of the municipalities are limited or already overloaded. The county has established sewer districts by state law and is operating some plants outside the incorporated areas.

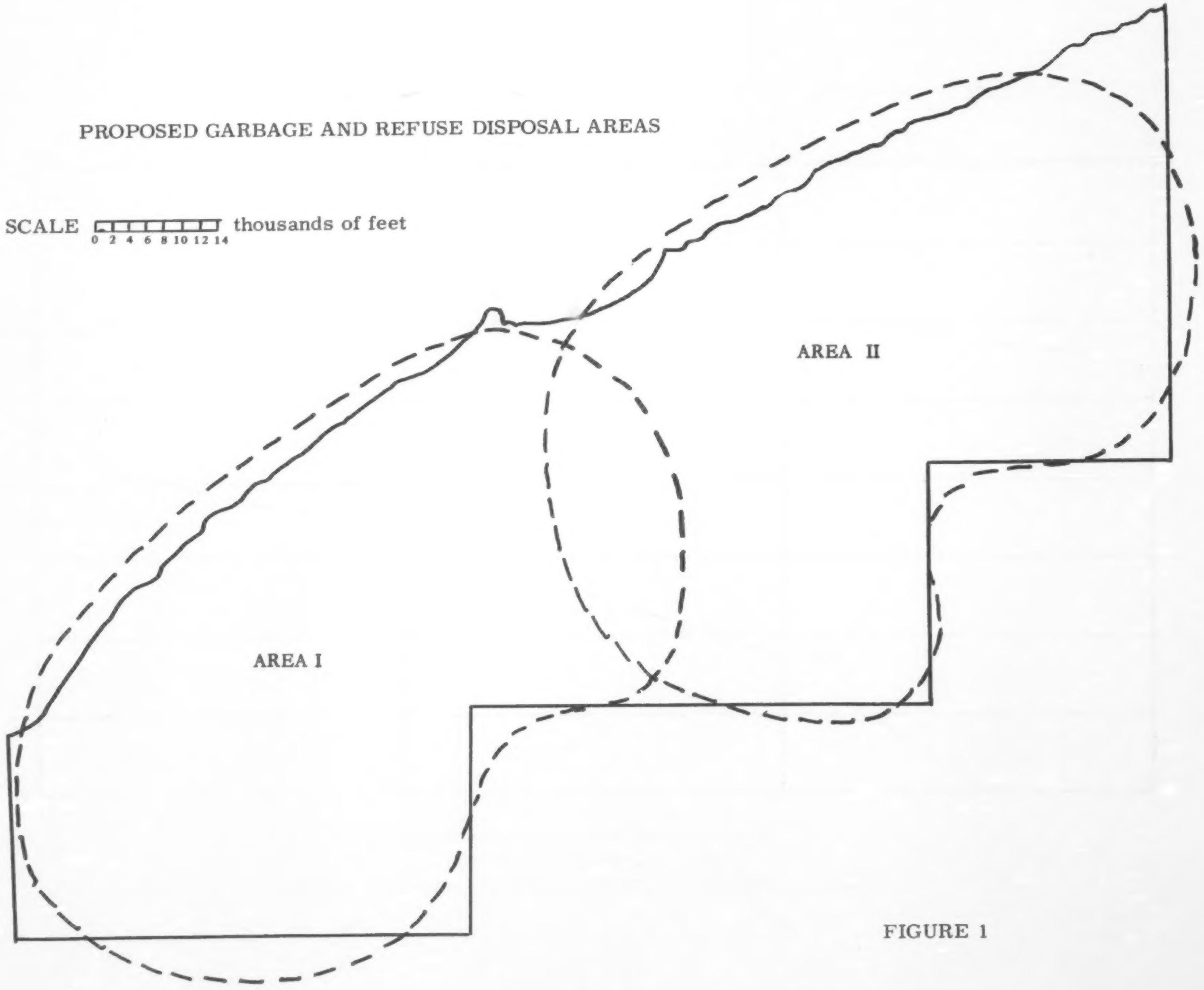
There are two major streams in the area that discharge to the lake. The one in the western portion flows north thru "H", "L", "C", and "A". The other river flows from east to west thru the county and empties into the lake in "M". Both streams are labelled "low-flow" streams and are subject to flooding in the spring and during heavy rainfall. The run-off is rapid.

THE PROBLEM

Be prepared to discuss the situation and to present your solution. You will not be expected to write a complete solution, but you will be expected to briefly enumerate the factors to be considered and to make recommendations for a preliminary plan. You will be expected to submit a list of recommendations based on your study of the problem and the discussions.

You are also to complete a short quiz on the course which will be given to you at the workshop.

Be sure to bring with you to the session this copy of the situation.



PROPOSED GARBAGE AND REFUSE DISPOSAL AREAS

SCALE 0 2 4 6 8 10 12 14 thousands of feet

FIGURE 1

PROJECTED REFUSE and GARBAGE VOLUMES BY AREA
(Figures in Tons Per Day)
(Does not include industrial wastes)

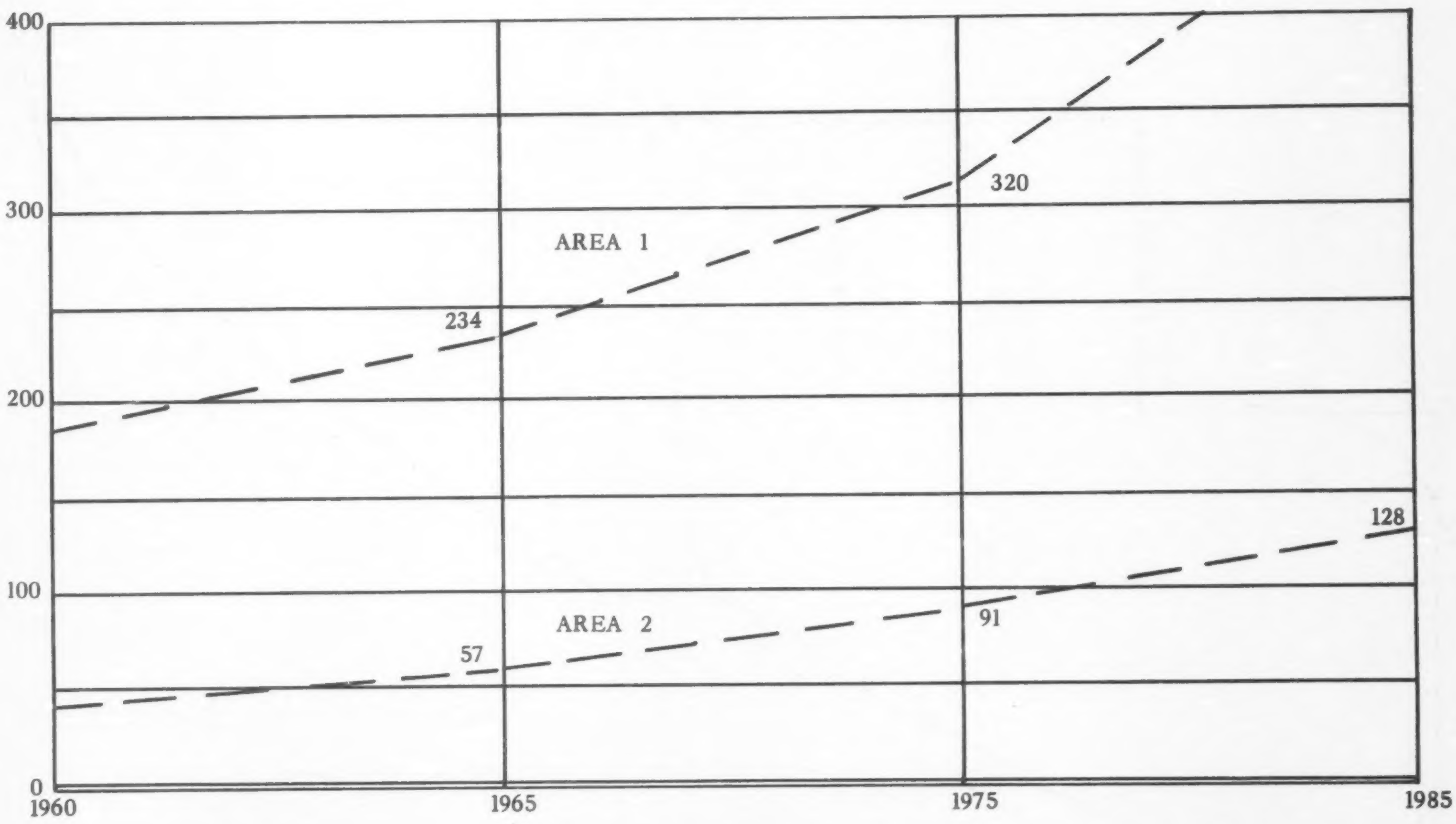


FIGURE 2

TABLE NO. 1

RESIDENTIAL REFUSE AND GARBAGE

Political Subdivisions	Population	Volume @ 3# per person	Volume in tons
Cities			
A	12,467	37,401	18.70
B	15,760	47,280	23.64
C	15,058	45,174	22.59
D	18,749	56,247	28.12
E	16,116	48,348	24.17
Villages			
F	269	807	.4
G	670	2,010	1.0
H	4,241	12,723	6.36
I	4,354	13,062	6.53
J	3,290	9,870	4.94
K	292	876	.44
L	360	1,080	.54
M	4,267	12,801	6.4
N	477	1,431	.72
O	658	1,974	.99
P	885	2,655	1.33
Q	1,347	4,041	2.02
Townships			
R	17,298	51,894	25.94
S	4,584	13,752	6.88
T	10,286	30,858	15.43
U	3,860	11,580	5.79
V	1,502	4,506	2.25
W	3,291	9,873	4.94
X	8,494	25,482	12.74
			Total 222 plus

TABLE NO. 2

VOLUME OF INDUSTRIAL REFUSE DISPOSED

(Figures in Tons Per Day)

	Disposed on Site		Public or Private Landfill	
Political Subdivision	Burnable	Non Burnable	Burnable	Non Burnable
A R E A 1				
"C" City	20.17	.17	1.76	18.16
"B" City	.12	-0-	-0-	-0-
"R" Township	3.05	1.00	.56	.04
"S" Township	-0-	-0-	.13	.13
			Subtotal	20.78
A R E A 2				
"T" Township	34.68	32.13	.7	2.8
"W" Township	-0-	.25	1.00	-0-
			Subtotal	4.5
SUBTOTAL (2areas)	58.02	33.55	3.52	21.13
Adjacent County	-0-	-0-	3.00	12.00
T O T A L	58.02	33.55	6.52	33.13

EXISTING REFUSE and GARBAGE DISPOSAL SITES

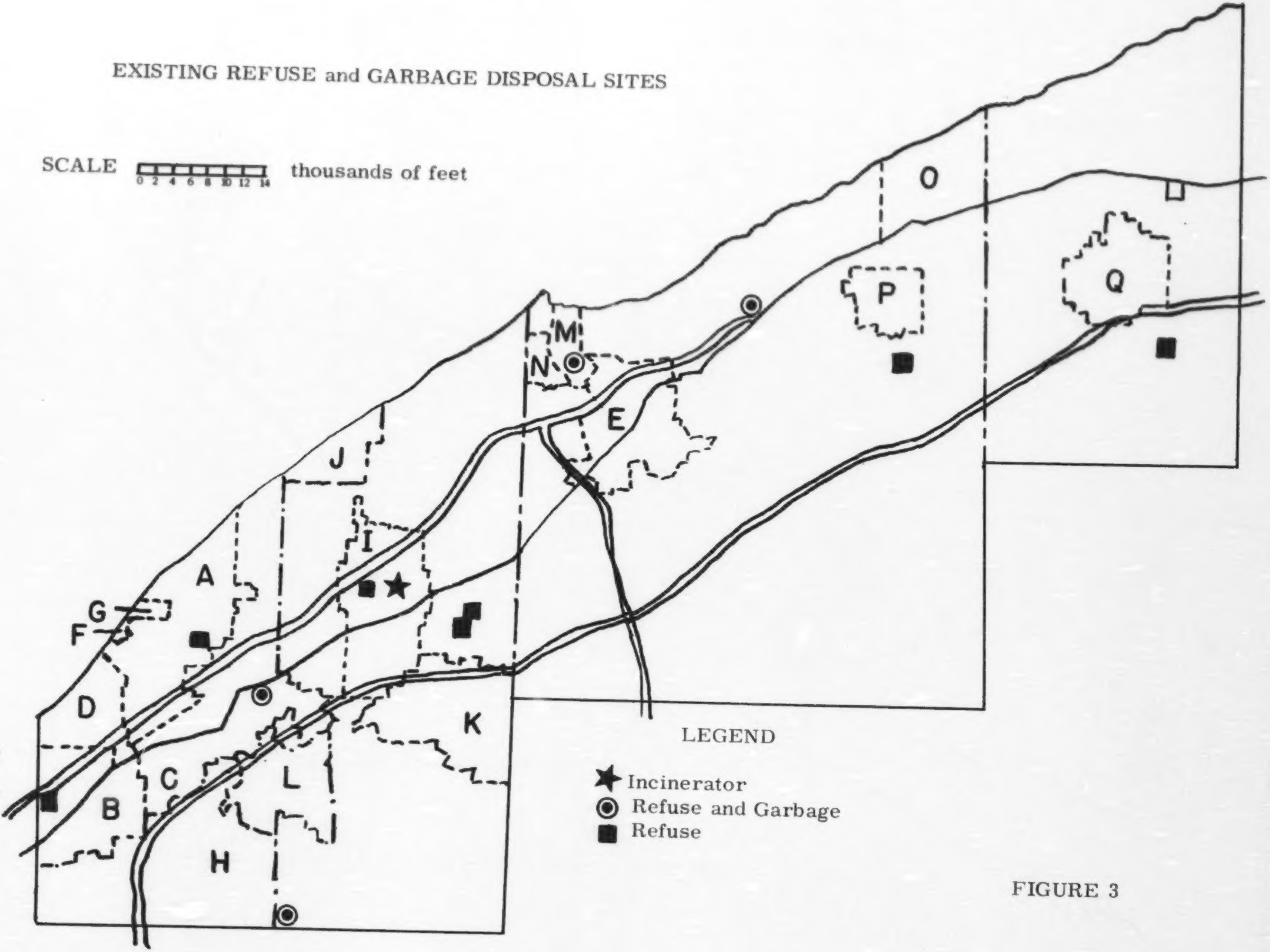


FIGURE 3

REFUSE and GARBAGE DISPOSAL IN OUR COUNTY

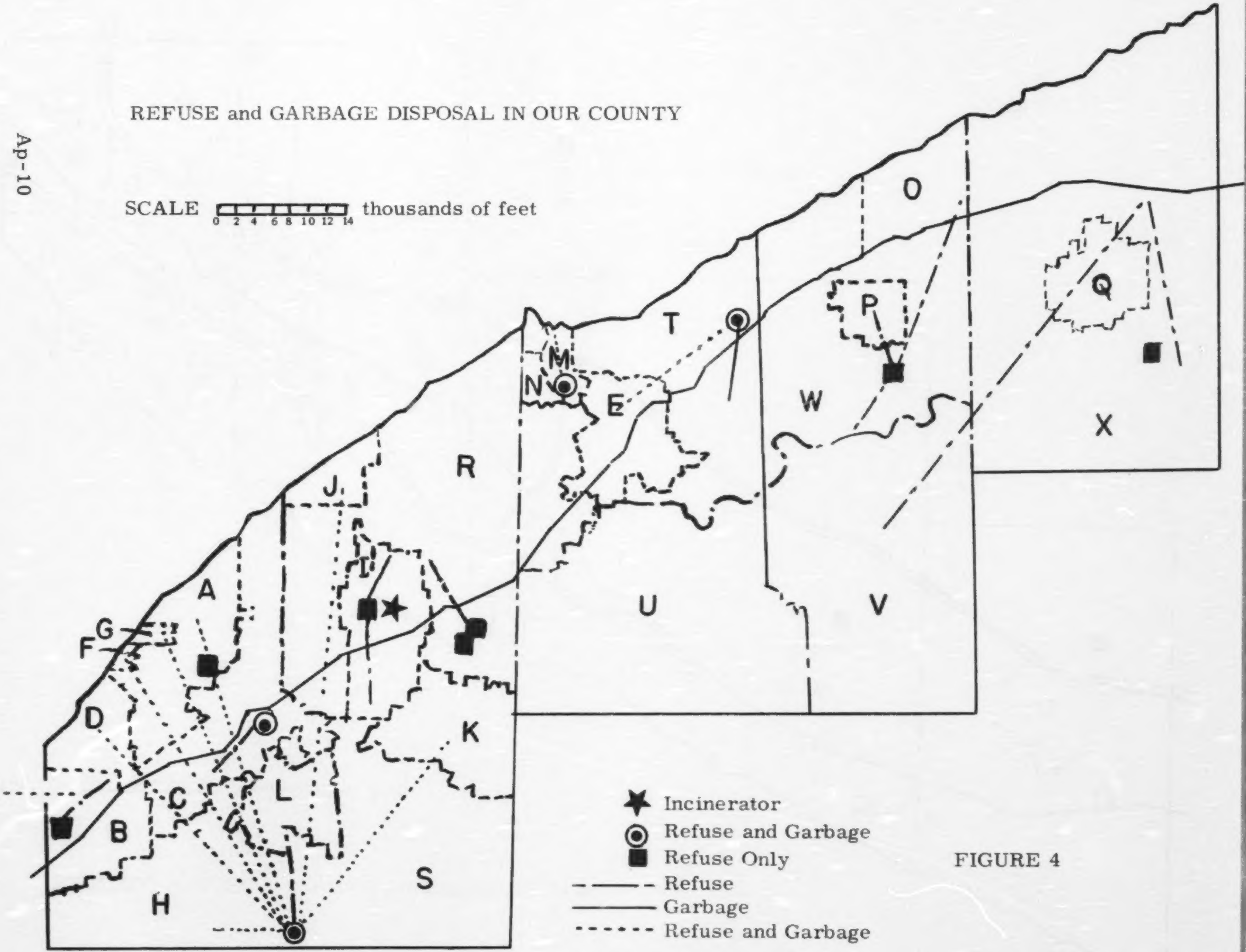


FIGURE 4

TABLE NO. 3

VILLAGES	H	M	P	J	K	O	I	G	F
GARBAGE									
Home Garbage Grinders Req'd	No		No	No	No	No	No	Eith	No
Home Incinerators Required	No		No	No	No	No	No	Eith	No
Operate Own Disp. Facility	No	Yes	No	No	No	No	Yes	No	No
Plans for Disposal Facility	No	No	No	No	No	No	No	No	No
Garbage Disposed Where	1	11		1	1		2	1	1
Type of Operation	PL	PUL		PL	PL	PL	PUL2	PL	PL
Volume of Garbage Hauled		5cy	1t/d				2t/d		
% of Non-subscribers to hauling service	50%		30%	15%	0	66%	45%	0	
Another Landfill site avail'ble	No	No	No	No	No	No	Y 3	No	No
Do you have an Incinerator	No	No	No	No	No	No	Yes	No	No
Term Agreement with another P/S	No	No		No	No	No	No	No	
RUBBISH									
Where Rubbish Disposed	1	11	6	1	1	6	2	1	1
Type of Operation	PL	PUL	PUL	PL	PUL	PUL	PUL	PL	PL
Volume of Rubbish Hauled		w/g	3t/d		2cy			2tl/w	
% of Non-subscribers			30%	15%	0	66%	50%	0	
Utilized but not oper'd by P/S	No		No	No	No	Yes	Yes	No	Yes
Term Agreement with another P/S	No			No		Yes	Yes		No
Fee							140/y		
MISCELLANEOUS									
R & G collected together	Yes	Yes	Yes	Yes	No	Yes	Yes		Yes
Pub. or Pri. coll'n for Rub.	Pri	Pri	Pri	Pri	Pub	Pri	Pri		Pub
Pub. or Pri. coll'n for Gar.	Pri	Pri	Pri	Pri	Pri	Pri	Pri		Pub
Name of private hauler	10			9	8	7	4	1	
Bids from Private Hauler	No	No	No	Yes	Yes	No	Yes	Yes	Yes
Term agreement w/hauler	No	1yr	No	3yr	1yr	No	3yr	Yes	Yes
Fee				1,800	208/M		5		110/M
Public Collection Fees			0						0
Coll'n of Industrial Wastes	No		No		No		No		No
No. personnel employ. P/C	0				2p/t			0	0
Oper'n of san. landfill		Yes	Yes		Yes		Yes	No	

1. Quigley's Dump "A" Twp.
2. I Village Dump
3. 10 acres-No. of present dump
4. Chas. Oesterlie
5. $1.50 per month
6. Webb Rd., "W" Twp. Dump
7. Tri-County Disposal Co.
8. Frank Donaldson
9. Lake Disposal Co. Mr. Randal Teter
10. Harvey Stickel
11. "M" Village Dump, southeast end of Village

TABLE NO. 4

CITIES	D	A	E	C	B
GARBAGE					
Home Garbage Grinders Required	Either	Either	No	Yes	Either
Home Incineratore Required	Either	Either	No	No	
Operate Own Disposal Facility	No	No	No	Yes	Yes
Plans for Disposal Facility	No	Yes	?		
If so, with whom?		Adjac.	?		(2)
Garbage Disposal Where	(1)	(1)	Booth	(8)	(5)
Type of Operation	PL	PL	PL	PUL	I
Volume of Garbage Hauled		5t/day	25t/day	68 cy	
% of Non-subscribers to hauling service				100	0
Another Landfill Site Available	No	Yes	No	No	No
Where Located		Eastlk.			
Do you have an Incinerator	No	No	No	No	No
Term Agreement W/another P/S		No			
RUBBISH					
Where Rubbish Disposed	(1)	(1)	(9)	(8)	(4)
Type of Operation	PL	PL	PL	PUL	PL
Volume of Rubbish Hauled	(10)	5t/day		30 cy	
% of Non-subscribers					0
Utilized but not Operated by P/S	No	No	Yes		No
Term Agreement W/another P/S		No			No(3)
MISCELLANEOUS					
R & G Collected Together	Yes	Yes	No	Yes	No
Pub. or Pri. Coll'n for Rubbish	(11)	Pri.	Pri.	Pub.	Pri.
Pub. or Pri. Coll'n for Garbage	(11)	Pri.	Pub.	Pub.	Pri.
Public Collection Fees			No Chg.		
Name of Private Hauler	(1)	(1)			(6)
Bids from Private Hauler	Yes	Yes	No	No	Yes
Term Agreement with Hauler	Yes 1yr	Yes 1yr	No	No	Yes (7)
Fee	3450 mo	29400Yr			(3)
Coll'n of Industrial Wastes	No	No	No	No	Some
No. of Personnel Employ. P/C			3	6-8	0
Operation of Sanitary Landfill			No	Yes	No

1. Quigley's Dump - "S" Twp
2. Plans with Adj. municipality
3. $2800 1st yr; $2900-2nd yr.
4. East 289th Street B City
5. Incinerator
6. Raymond Roy
7. 2 years
8. "C" City Dump
9. Private Collectors
10. 400 Compressed Cu. Yds. both Rubbish & Garbage
11. Private Haulers Paid by City $3450. per month

Note: See Table 5 for Legend

TABLE NO. 5

TOWNSHIPS	U	V	T	W	R	X	S
GARBAGE							
Home Garbage Grinders Required	No	No	No	No	No	No	No
Home Incinerators Required	No	No	No	No	No	No	No
Operate Own Disposal Facility	No	No	Yes	No	No	No	No
Plans for Disposal Facility	Yes	No	With	No	No	No	No
If so, With Whom			E City			(1)	
Garbage Disposed Where			Booth				
Type of Operation							
Volume of Garbage Hauled				1t/d			
% of Non-subscribers to hauling service			10%	90%		75%	
Another landfill site available	No	No	No	No	No	No	No
Where Located							
Do you have an Incinerator	No	No	No	No	No	No	No
Term Agreement W/another P/S				No			
RUBBISH							
Where Rubbish Disposed		(1)	(4)	(3)	(2)	(1)	
Type of Operation		PL	PUL	PUL	PUL	PUL	
Volume of Rubbish Hauled	3t/w	3t/w	25t/w	2.5t/w			
% of Non-subscribers			10%				
Utilized but not Operated by P/S		No	No				
Term Agreement W/another P/S			No		No	No	
Fee				450/y			
MISCELLANEOUS							
R & G collected together			No	No	Yes		Yes
Pub. or Pri. coll'n for Rubbish			Pri		Pri		
Pub. or Pri. coll'n for Garbage			Pri		Pri		
Name of Private Hauler		(6)	Many				
Bids from private hauler		No	No		No	No	No
Term Agreement with hauler			No		No	No	No
Fee							
Public Collection Fees							
Coll'n of Industrial Wastes		No	Yes 5		No	No	
No. of Personnel Employ. P/C			0				
Sanitary Landfill Operation			Yes	Yes	Yes	Yes	

1. Rt. 20 "X" Township
2. "R" Twp. need new site
3. Webb Road Dump "W" Twp.
4. Heisley Rd. & Temple Ave. "T" Twp.
5. Lubrizol Uses Dump
6. Ed Grant

PL-Private Landfill
PUL-Public Landfill
t/d-Tons per day
t/w-Tons per week
t./w-Truck Loads per Week
I-Incinerator
c.y.-Cubic Yards
w/g-With Garbage
/m-Per Month

APPENDIX I

WORKSHOP SESSION

MR. ROSENDAHL: As many of you who are associated with the various functions of the State of Ohio have run into me previously, you know my feeling on getting the planners, the engineers, the health people closer together in the overall picture, but I have not heard it emphasized enough as yet. I will sound like a public health person, but I will also sound like a citizen because I am sure you will hear this from Mrs. Rosenblum when she speaks tomorrow.

It is a fact that we have given sewage and water a tremendous emphasis in many of our states and many of our departments. We should have been recognizing long before this, that on a greater scale, the importance of the overall refuse problem, because it is similar, although a manual operation to the extent that conveying such to the treatment or disposal facility is done by manpower, with machines.

Call this your conduit if you want, but it takes and does require some serious planning.

Paul Reid just made the statement, it is very comprehensive, it is not the work of the planner alone. It isn't the work of the consulting engineer alone either, but it involves quite a bit of detail development.

The problem that was given you, the so-called master refuse plan, is a hypothetical plan, but is a plan of a study that was taken by a planning commission, the collection of a certain amount of data published in 1962.

As I tried to say on the first page, this data is outdated and present growth has not met the contemplation, but I should say, is actually exceeding what the percentage, growth-wise, was expected to be. This is an area in Ohio. In selecting the plan, I tried to select one not too complete and not too varied or include a lot of detail data that you won't have time to do.

We will hope that those of you who are here, in your dis- discussion today, will develop the facets that go into this plan. In other words, I am anxious to exercise your mind to the facts, and to realize that there are things missing in this plan before you could come to any conclusion regarding a concrete plan.

Too frequently in our health departments, in the control of landfill operations, garbage site selection, slum clearance and all other facets, we are expected to devise plans and procedures. There is not the manpower, nor is there the supplemental legislation that is needed to really exercise these plans and make them function.

We have had cases in Ohio where they have attempted to do this, and in court actions, through injunctions, and so forth, local agencies have been restrained from doing it, primarily on the basis of the fact that if you close this dump up right now, there is no place to take care of the needs of this community. This usually comes out of the public health board in the cases where it has been exercised by townships and so forth.

We now have enabling legislation in Ohio, for instance, that permits our county commissioners to set up solid waste disposal plants as we do now with water and sewage facilities.

Let me predicate this to all of you to go back to your states, and maybe you have it already in the structure of your states, but this should be examined by all of you because all of you have a concern in this. This is not just for public officials, but it is for planners, consulting engineers, just as much as building codes and everything else. If you are designing an incinerator or boiler plant, you are concerned with what legislation has been passed to enable you to do some of these things.

If that legislation is bad, it is incumbent on you, either through your associations or your societies or otherwise to try to get it corrected. You have a teaching job to do. Let's all recognize that as the biggest thing in this whole problem, the teaching job, teaching the public that they have got to be aware of what is happening.

Again, the word that comes into the picture so much today in planning and all such cases, is ecology. It is the ecology of all people concerned. We need economists. We need sociologists. We need psychologists, planners, engineers, and architects and everyone, including public officials to do this, both the elected public officials and those who hold their job by virtue of civil service or otherwise.

You, as professionals, are vitally concerned in these fields. You cannot just sit back and say, "I can't do anything about this. I don't have the authority," and so forth. You must make them your concern.

I am new to health service. This my fourth year. I have had an awakening. I spent thirty years in private practice. I face things sometimes that we have in legislation, but I don't stop trying to fight for something else. I don't stop preaching because we have a limitation, and that before we have gotten our ears burned, but this doesn't mean that we should stop fighting for something we want.

Merely to awaken in your minds some of the problems, in the study of data that was collected, look at some of the things in the data. I will answer for you right now the fact that someone said, "I can't make a recommendation on this score because I don't have sufficient data."

This is the approach I think you should take.

Let's look at it. Let me give you a few facts on the outside of this. I mentioned in the problem the fact that this "Our" County is adjacent to another county which is highly metropolitanized, has 52 incorporated communities, a very, very small area of that county that still is county, country region. This is a megalopolis, a term that we use in urban planning, a core city with many small incorporations that do not choose to go with the large city either by reason of a political nature or environment. They choose to go it alone.

Many of these communities are old and their history goes back quite a few years. By the same token, this creates a problem in this larger area and because, again, of distances in many areas, county lines have to jump. Right adjacent to this on the western boundary is a whole series of communities of quite high density, small areas highly built up that you cannot neglect in looking at any plan because this has influence on you, in your own area, in "Our" County.

Some of the data was collected in this study, but it was not in the end results of this problem because the report from the planning commission did not endeavor to solve the problem. It merely tried to awaken a "look-see."

I might also add that there is a study going on in this county at the present time under a 701 program, and it is more thorough. It has collected some additional data. The planner from this area advised me that they have had growth commensurate with that which is to be expected with two main highways going through.

There is an interstate highway which goes across and connects with the New York State throughway, so there is a high travel area there.

Again, we come down to the fact that here is a problem of transportation.

In studying that transportation and any further development of transportation, you are also going to have to take into account collection routes, routes of heavy hauling, and concentration that you will have at hours and times that may be having to use that area, crossings and so forth, to get to your disposal site. Mr. Casper referred to the mandatory consideration in the overall transportation planning studies today, and that these other facets have to come into the picture as well.

You can't plan the transportation alone without considering such things as this in the transportation of hauling vehicles such as waste collection vehicles and so forth that may be beating a path to a certain area. This is very typical when you look at one of your plats indicating all of this going to a dump that is in the township area in the western part.

I would like to now throw this out on the floor and extract from each of you some discussion and some questions and answers so that we can make this into an open discussion.

Maybe the term workshop is a little ambiguous. This is so commonly used in our terminology today that when it was put in the program, we thought, "All right, this will be a working area in which we will do something a little different."

From here on out, let's open up. I will ask for questions from the floor at this time, or statements from the floor, shall I say, whether they be statements of question or whether they be statements of fact.

FROM THE FLOOR: I would like to know, Item 1, is it to be by landfill? If it is to be landfill, is the ground available, and where is the location of the ground to be for these?

MR. ROSENDAHL: All right, everybody but Bill Wilson, I am going to keep you quiet for just a minute. Who would like to state what you think should be the answers?

MR. KALKHOFF: I have a solution. I am willing to let you take shots at me if you wish, but I would label this preliminarily as not to be used.

Because there are certain things, gentlemen, to be serious about, I would like to know where the sewage disposal plants and so forth are because there may be a utilization of services, but this is something that I can give you. I will read the plan through and I may wish to modify this when I find out where the other services are.

Just on the basis of the first step that I took, I projected how much actual rubbish you are generating that you have to destroy. I took a hypothetical five days, and I found out through experience, even if you run the incinerator six days, you get five days' efficiency. You have a half day on Saturday to clean up, and on Monday they clean up. You have five days if you want to face it.

You may argue that point, but I am going on experience.

I find that in 1985, you are going to have actually 791 tons that you have to destroy per day because your citizenry are generating every day of the week and you are burning five, so it is actually multiplied by seven. Using the same figures you need 600 tons -- 560, but to round it off again to 600 tons, in 1975, and at the present time you need 406. We will round that downward and say you need 400 tons at present.

I would recommend, again, preliminarily, to construct either 600 tons of facilities now or 800 tons, depending on whether you are going to be able to float a bond issue in another few years.

My prime recommendation would be 600 tons, which I will support.

I would recommend 600 tons at present, operating either -- again depending on the economics -- 16 hours a day or one unit through the week, and pick up the slack with the other unit toward the end of the week, then run the slack unit as lead unit the next week. This is something that I would have to get more information on, your economics and how you wish to run it. I can't tell you, I can just give you these figures.

Reserve the additional 200 tons to be constructed in or around 1975, again depending on how you grow, et cetera.

The reason for this is, gentlemen, in the past ten years we made more technological advances in incineration than at any time in our history. I think we are going to do the same or make much more, whether it is incineration, composting, chemical decomposition.

We can take care of this other 200 tons. We may want to implement this to 300 tons or maybe more in 1975 or thereabouts. I would recommend the idle incineration station which I assume, again, that we can take over -- you have to tell me -- to a bulk loading station because at the present time, it is located at the more or less eastern extremity of concentration of population, thereby you could utilize the trucks more and use the transfer to take it to the incinerator.

I would recommend the construction of the incinerator at the dump east of the city E, up in here somewhere.

MR. ROSENDAHL: Central portion of the county.

MR. KALKHOFF: In the north central, or more or less a little south of the true north central, being that it is centrally located, it has a good road network, and your population growth is predicted for the eastern end. You will be able to serve them with short hauls.

I would very definitely recommend that the ten acres that is available be purchased north of Village P for future use, whether solid landfill or residual.

I would recommend that we fill the existing dump sites with non-combustible rubbish, and later on, when you fill the site at the incinerator, whichever occurs first, you could possibly use it for overflow of the incinerator ash, and then after all these dumps are filled, then use the 10-acre site.

At a later date, or possibly at the time of construction at the new incinerator site, you would recommend the consideration of the construction of a transfer station that you can pick up the non-combustibles that are generated in the western section and also whatever got through the segregated part right to begin with and have the transfer truck that is hauling the rubbish from the original incinerator station, re-transfer this to the dump site.

In other words, that would avoid handling as much as possible. As I say, this is what I would recommend to start with.

MR. ROSENDAHL: I might say, looking at some of these prints and various different ones, that area E is the large area almost at dead center, near the top of your map, if you have a bad print. The P didn't print too well. Over to the right, there are really three community areas there. P is the lower one. The one up on the shoreline of Lake Erie is O and Q.

FROM THE FLOOR: There are a lot of questions that I have that would enter my mind. This is a typical area that I am familiar with. With this many units of government, we had better design for 1985 because that is when we are going to get it done, because it will take that long to get the units of government together. I think we have to assume some way to get the people together.

FROM THE FLOOR: You know your political complexity better than I do. I figure that from the basis of the consultant, they want a recommendation. What you do in your own location, you have to do that preparation. I will help you, but I didn't know -- you didn't state anything about the political complexity. I know where this location is. I figured that the organization was set up to start with. Maybe I am wrong.

FROM THE FLOOR: Is there an organization?

MR. ROSENDAHL: There is a regional planning commission, and there are people.

FROM THE FLOOR: That is a handicap right there.

FROM THE FLOOR: Well, I don't have anything definite to say on that, but the only logical approach for a long period of time is going to have to encompass inter-governmental cooperation, and under Ohio law, since we can't get up a regional district, I think this would be the whole basis for the state plan.

FROM THE FLOOR: I agree with you wholeheartedly, but that would be turned over to the legal department. I don't make legal decisions.

Seriously, this is based on something that was handed to me in my present capacity and I would have to get more information on this, but I based this on the necessary governmental functions being set up, and we were proceeding from there.

At least, they wanted to start setting up the governmental functions and I, as an outsider, don't want to get in local politics.

FROM THE FLOOR: I would like to ask this: Have you studied the population of this small village and do you think it is possible to do it with the money they have on hand? This is still real fine. They would like to do it, but they can't afford it.

FROM THE FLOOR: Seriously, they are going to have to get the money or else they are going to have to dispose of it themselves, and if they don't have the money to join into a regional plan which should be considerably cheaper, because you will be utilizing possibly a vehicle once a week for this small community, if this community has to buy their own vehicles or do a contract job with some other outsider, they are going to find it more expensive. This is, again, a governmental function and I am looking at it from the engineering standpoint and that is why I wanted you all to take pot shots so we could start something.

FROM THE FLOOR: I wonder if this is in the part of Ohio from where we have been shipping coal for the last 25 years.

MR. ROSENDAHL: No, this is in the northeastern area.

FROM THE FLOOR: What is the cover for the coal up here? Is anybody finding that out?

FROM THE FLOOR: Several thousand feet.

FROM THE FLOOR: We might be scarifying the earth for some other purposes in the near future, and we could bury some of our troubles.

FROM THE FLOOR: I would still like to have my question answered. I mean, before I start on a sound approach, I would have to know some things. Do we or can we or can we not afford landfills, incinerators, or where do we go?

MR. ROSENDAHL: All right, this is a good point. I think Mr. Reid touched on this and I know in the opening talk this afternoon, Mr. Bremser pointed it out, even though he was approaching it not from a complete plan, shall I say, under land use and other policy, but more or less strictly on a master plan for disposal of an area, and refuse collection.

These are some of the facets and this is a good question because it should bring to your mind very emphatically -- this is one of the loopholes in this information which has been given to you. There is an economic factor here. There is a factor of population and of people put together. There is a certain amount of expenditure data which has been given to you.

You had insufficient data from the questionnaires that were sent because they are not answered completely.

Again, whether you use landfill, incineration, composting is not the only determining factors. It is going to be based on many of the factors which have been coming up in this course from Monday on when we have had Collection. We have had Incineration, and Mr. Michaels gave you some good points on that yesterday, kind of land that you might be using.

I am sure you got a lot out of the composting paper.

Mr. Kalkhoff has also brought out some facts that are needed before he could come up with a constructive plan. He would have to have some additional facts, but he has already assumed some. This is what I hoped would come up on the floor early, and open the discussion.

MR. FLOOD: I think Amos is jumping to conclusions on the use of incineration for this area.

MR. ROSENDAHL: Good.

MR. FLOOD: One of the things that will have to happen if the city is using an incinerator will be a long haul for about two-thirds of the county. The investment will be $3,600,000 based on the figures that Michaels gave us in order to provide 600 tons capacity per day.

What is the matter with sanitary landfill? You could have three sanitary landfill sites here for the disposal of refuse. It seems this is going to be merely an intermediate solution, the question of acquisition of land, the acquisition of stock equipment in order to serve the sanitary landfill sites.

If you selected incinerators to solve this problem, one of my colleagues said it will be about 1985 before you will have this, so you had better plan for 1985, and plan 800 tons and get a jump on population by that time. It will stand because of the increase in prices of construction. It may be up to five million dollars in order to provide that capacity at that time.

I think that as long as the landfill is available -- and the preamble to the problem says that only three things can be considered, sanitary landfill or incineration. We should use the one that is immediately available and is going to change less. You have more probability of getting a satisfactory solution quickly if you do it that way.

FROM THE FLOOR: As I understand it, this based on three pounds per capita?

MR. ROSENDAHL: Yes, this was projected in 1962, but you know it has gone higher since then.

FROM THE FLOOR: I think you are kidding yourself there. I think you should be planning on the basis of 5 pounds per capita.

MR. KALKHOFF: I have a response to Leo.

What I did, I was a little crooked. I got a road map and I looked it up and I know where this is, even if I am from out of state, but the land in that area is extremely valuable. I analyzed your small communities and most of them are pretty close to filled dumps.

I assumed -- maybe I was wrong, that this land is extremely valuable, being close to one of the fastest growing metropolitan areas. This is one of the fastest growing megalopolises and the natural growth is due to go east, due to certain complexities on the west of this area. This land is extremely valuable.

I don't think -- or at least I assumed -- you couldn't buy this land and there would be enough available for landfill because, knowing the terrain of this particular land, and knowing the -- shall I say -- class of people that live on this land, and most of them being of high income -- I told you I am a little crooked on this -- and knowing the number of cities in this area, I don't think they are going to go for anything like selling their expensive property, and I don't think any unit can buy this property unless there is some area that I don't know about for landfill.

As I say, if I had more information, I may have gone the other way, but I assume what was in here plus what I sneaked out of a road map was true.

MR. ROSENDAHL: Amos, stay on your feet a minute. This is tied in with yours.

What, in your study, would you propose to do with the twenty per cent we have been repeatedly talking about in the last days on residue from the incinerator, and that which doesn't go through?

MR. KALKHOFF: That I would return because I mentioned in here -- maybe someone mentioned it -- I would return this residue. First, I would dump it at the site, this dump site, to decrease handling. I assume this dump is nearly filled from the size of the city here, the large city. I would utilize that first. Then I would use the transfer truck to return it to the various other dumping areas, taking one at a time until we exhausted them, and recover that land.

FROM THE FLOOR: Is that an open dump?

FROM THE FLOOR: No, I would use a landfill.

MR. ROSENDAHL: I used the category in Ohio that you are probably not familiar with. We had a study and we have a lot of photos. One of our engineers who has his own plane has done a lot of back door looking at these things. We have come to almost three categories here. You have an open dump, a landfill, and a sanitary landfill. I like to use the three categories. If you use the term and want me to understand, you have to use one of those three.

FROM THE FLOOR: I assume that the officials in this county realize that they have a problem. It has been brought to their attention by the planning commission.

Now, I think that it is time that the county commissioners and the president of the county commissioners take hold of this problem and bring it to the attention of the officials of these other 25 government units, and then it would be their responsibility to get cooperation agreements.

Whether this would take one year, two years, or twenty-five years to get these agreements, eventually they have to come to some agreement with all these other government agencies. Then, the county will have to take the leadership in hiring either a consulting engineer or somebody to prepare a master plan on how they are to proceed with this problem in this area.

The information we have here tells us there is a problem, but I believe it is inadequate to come up with a solution now. The master plan might indicate that land is to be acquired for future incinerator sites, or to operate sanitary landfills for five years and then go into incineration.

With a master plan in effect, they could proceed in orderly fashion as this county gains population and density and also the county commissioners will realize what their financial situation is, what the ability of the county is, and the reception that the citizens in this county are going to have toward the solving of this problem.

Basically, it is a problem of education, getting across to the people there is a problem which has to be solved.

MR. ROSENDAHL: I would like to call on Mr. Colpetzer who is from this county. He is the assistant county engineer.

MR. COLPETZER: The problem has been brought forth and I will bring it out a little more. Let's remember that the board of county commissioners are elected. Any solution that we arrive at engineering-wise, in order to be implemented, is going to have to take this into consideration. This county is adjacent to Cuyahoga County. The people in the west end have moved out from Cuyahoga County. They are predominantly, shall we say, of a different political party than the party in the east end of the county. We can't arrive at the solution to the problem without taking this into account.

The financing of the whole thing, the way it is handled in getting agreement with the various municipalities, would have to take this into account also.

FROM THE FLOOR: I was approaching this in a little different light. I think the gentleman over here brought out the key thing you have to start with, and we are saying we either assume it is being done or we are avoiding it, and we have to form a sanitary waste disposal authority district, and especially in the light of the new state statutes that allow us to do this. I think that is the first thing you have to do.

Secondly, the county officials are going to have to be elected and all the city officials involved in this.

As has been proven, and it has been repeated, the county area in Detroit with the three counties are having to go out and establish a district. That is something which must be done here, otherwise, they are just going to keep going their own way or not get together because of politics or a number of things.

This is being brought out here today in this planning. We have to sell the public this program. All these civic groups like the League of Women Voters and anybody else, we have to go to them and make them aware that this is our problem. They have made an attempt at it. I think it has to be carried further.

Then, when this is established in some form, possibly they could apply for a federal grant for planning purposes because federal money is available. I assume it is available, especially if the local fund will not quite cover the study itself. That is the second point.

Thirdly, assuming the authority has been formed and they do have some financing for planning, engage the services of a reputable consulting engineer who has the experience to work with us and work with this problem, to come up with a plan. We went through this, this afternoon, how a plan can be developed. I don't want to go in that right now because that is old hat.

Assuming a master plan has been completed, and in this master plan it will be brought out about the western portion where the heavy population is now, it is very possible that an incinerator can be put there in the center of the western portion, and it looks very possible that with the future development, with the future population being developed in the eastern, the less sparsely populated now, landfills, two or three or whatever can be developed from the facts when they are dug out, could serve them for some time, with very possibly incineration or other means being used in the future.

A situation that is very typical there, that is not brought out in this data and is very local, if Q dump is a twofold operation there. It happens to be right next to the eastern end of Cuyahoga County. This serves the whole eastern suburbs of Cuyahoga County. These people are all scurrying over to Lake County.

Let's say you don't have a joint county relationship due to the state statutes. Immediately you are going to have to do something other than bury the trash in the neighbor's yard. That has to be a part of this.

Let's say the master plan, then, is completed. It will have to be submitted to the refuse authority for review and appropriate approval. Then, we can have such a plan or bond issue or however it works out, and if approved, follow it through with implementation.

I think at the start, this thing has to be the development of an authority. This is the only way it is going to be done and this is the way we are going to move ahead.

MR. FRANCOIS: Being from the Virgin Islands, a small place, we don't necessarily have all of these problems, but as I read this over and listened to some of the discussions, a few things came to my mind. I am not familiar with the midwestern area. Nevertheless, these things came to my mind.

This is a problem of the planning commission now. It seems to me that the planning commission is trying to work around a certain allotment of money they have. Invariably when you have this sort of thing, you always end up with something that is too small.

It seems to me that what should be done, the planning commission should come up with the best plan. We should then take this plan to whoever has the final say and tell them what it does is for the people living there, let them make the decision as to whether or not they want to solve this problem or not. You have done your work coming up with the plan.

Secondly, based on this morning's discussion, it has been established that this is an Ohio area, the soil has gotten to the point where it needs building up. This might be an area to look into and use this as a guinea pig, so to speak, for the State of Ohio, and if it proves helpful, it might enable you to solve several of your problems.

FROM THE FLOOR: My committee worked until three o'clock in the morning working on this problem. We started basically with the premise that if we used this area where there is an existing incinerator not being used, we don't know whether it could be rehabilitated, or whether we could use the site for a sanitary landfill in the eastern area somewhere, but the thing that dictated this was two things. One is that where the present incinerator is, the people may have developed some tolerance to an incinerator in this area. As I get the information, citizen tolerance is rather important. In the area, too, I understand they have landfills of various sorts and they may accept with less opposition a landfill operation in this area, but the fact that they have had an incinerator would indicate they would accept the incinerator in this area, and that it would reduce the haul if you had an incinerator in the heavier operating area and a landfill to the east.

MR. WILSON: I happen to live in that county. In fact, I furnished information for this problem. I didn't know it was so bad.

MR. ROSENDAHL: You looked at it after three years.

MR. WILSON: We still have the same problem. The biggest problem we have is that in that section E, that is the only section in the county where we have what you might call an approved type landfill. All the area of the county have open dumps, really open dumps. In most cases in the eastern part, there is no garbage, but in most of the areas, you have a plain open dump with no dirt available for backfill. That is a section down in this area, for instance, where they have no cover for this part of Lake County, but they have 35 other communities from Cuyahoga County seeking further south for land in which to dump.

Section E up there, the landfill is good for about two more years. Another dump down here is a logical place for a dump, and it is almost filled up now. E is trying to buy more land.

MR. ROSENDAHL: Being from that area, I thought you might bring in the point of E in the industrial complex that is there, it has to be considered. I did mention a little about that, the fact that there is water pollution and an air pollution problem. I don't know whether you missed that or not.

There is a series of plants located in there more or less mixed up with the others.

FROM THE FLOOR: I would like to direct a question to you for our information. Was the incinerator tolerated or was it not tolerated and that is why it was removed?

MR. WILSON: It was built for the village of Mentor having a population of a few thousand people. Now they have a population of 25,000, so they discontinued using it.

MR. ROSENDAHL: I think you could draw your own conclusion from that, Amos, about how it was designed.

FROM THE FLOOR: It would make a good transfer point.

FROM THE FLOOR: The matter of the cost of the land, one thing Ralph Black left out yesterday when he was showing the California landfills, was the terrific expense of the property.

FROM THE FLOOR: In the Chicago area, I have seen land sold for $30 an acre and improved to $600 an acre, and that was by landfill. I have seen some of this land now sell for $3000 an acre.

They are talking about buying land that they already have, but this is a continuing problem.

This is one of the things that you are going to have to battle because of the initial cost.

FROM THE FLOOR: I was going to bring this up. It is something we expect in the state of Ohio. I don't know if the gentlemen representing the counties in Ohio are aware of this.

There is a section in the law about garbage and refuse, Chapter 303, Sections 01, 02, 03, 04, 05, and 06.

If you read this, gentlemen, the county does not have any authority to condemn any person's property. As soon as this plan has gone through and you decide to buy the site, if the person doesn't want to sell it, you don't have a right to condemn his property. I would like to point that out.

MR. FLOOD: Nevertheless, a refuse disposal authority could be set up by the State of Ohio and if they were empowered for this single purpose to do this and empowered to condemn land for this purpose, they would be, I hope, above the political hazard that the elected official has to face. They would be appointed for the single purpose of acting as commissioners of this authority whose single purpose is to dispose of the refuse. They could issue bonds, could make charges for collection of refuse.

One other thing that I am rather surprised that hasn't been mentioned here, how was this area set up for recreational facilities? Do they have all the parks they need? As I recall that part of Ohio, it is rather level. There is no reason why a landfill can't be built up in hills, too. We have done that in New York and we have made some fine recreational areas out of our landfill, Staten Island and the Bronx. They prepare a topographical map how this will be done when it is filled in. You don't have to have hollows. You can start at the high table land and build it up into hills and make a pleasing park.

MR. ROSENDAHL: I would like to go back up here and then we will come back to the last questions because I am going to give Bill Wilson a chance to talk pretty soon.

The state law as now set up does not give the State of Ohio, or the Health Department,any authority to carry out what he is talking about here. The State of Ohio, for example, is a state where our legislature looks favorably upon home rule. You do it on a home rule basis, and the municipality, the city, or the county is given authority. We do not have powers to step in.

It will be a long cold day in the legislature, until it gets to be of a serious nature, but this doesn't stop us. This is why the Department of Health is concerned with this problem. We are trying to help things at the local level.

Bill Wilson, would you like to -- I don't want you to read the new report, but I would like for you to answer Leo Flood on the question of the recreational areas and the flat area and what you are doing in that area and what you propose to do in the future plan is you have gotten that far.

MR. WILSON: First, about the plan. At the moment, the status is that we have proposed a countywide plan under the 701 Local Planning Assistance for counties which was passed last year. This refuse disposal or environmental planning is a part of a much larger program, and as such, will benefit from coordination with other elements. For example, soil surveys will help us in picking out desirable sites for a fill.

With regard to recreation, the status is that very recently the recreational authority was provided with money to purchase sites. They are concentrating the use of that money in a steeply sided river valley such as the Grand River where the drop is about eighty feet from the upper level through shale and conglomerate to the bottom.

However, as far as recreational sites, they have gotten very little progress in, let's say, 1000 acres out of a 6000 total that the plan was designed for. This is at the moment way behind in providing necessary space. When they get finished, they will have a pretty good selection of recreational facilities within a class. This involves generally steeply sloping land.

The kind of thing you have in mind, building up a recreational area, it was my hope that in developing the new plan we would be able to develop some sales appeal material based on landscape proposals for the specific sites.

FROM THE FLOOR: I would like to say I am relatively new to this field. I was handed a purported plan to build a refuse disposal plan. Being a geographer, I was not too excited because I wouldn't be up to it. After a couple of weeks, I asked if we could change the name of the report to Refuse Disposal Study. In other words, I didn't think at that time because of lack of information and so on we could formulate a plan. I wish we would have used our area of three counties for this hypothetical plan.

Maybe a geographer can shed a little further insight into this particular place because it seems to me that this county has the proper geographic characteristics that would allow perhaps composting to be used in part. I am not saying it could be used entirely, but this would be a consideration.

Here you have a ready market of tremendous urban areas, Cleveland and the western portion of this county. Also you have physical conditions here of the lake modifying the weather. This makes it very good for crops. Now, I think there are some areas under glass -- greenhouses in the county.

MR. WILSON: Actually, it is highly desirable for nurseries. The weather package for certain parts of the county is excellent. This is a booming industry, also a moving industry, moving away from the urban development.

FROM THE FLOOR: I think in your study you should look into this, and especially if you had soil available.

FROM THE FLOOR: I am a firm believer in planned financing and implementation of the plan. Financing is a very important part of the plan. For the aid of the consultants in trying to solve this problem, I might offer this: If this project were to be undertaken by the Board of County Commissioners under the new amended law - I believe it was House Bill 161 -- it is possible to finance the construction of these facilities through the sale of revenue bonds. That might aid you a little bit in planning your financing on the solution of this problem.

FROM THE FLOOR: St. Louis County has 96 municipalities. They have a population of approximately 850,000 people, not including the city of St. Louis. The city of St. Louis is not liable for the county, but the area of St. Louis County is about 500 plus square miles. They have no incinerator facilities in the county whatsoever. There are some in the city of St. Louis. You can see they have quite a problem of disposing of their refuse.

This problem is on the way to being solved now. In fact, it is going to be solved by the use of incinerators, together with the existing sanitary landfills that are used both as county operated, and a number of private plants which are beginning to be used up, but the point that I would like to make is to agree with some people and restate that I think the important thing in any program like this is to lay the groundwork for your future program, and this is a real job of education and public relations, and not something to be suddenly sprung on the voters, the fact that we are going to have a bond issue this spring to build some refuse disposal facilities. It is news to them. They don't even know that we need them, or why we need them, or how serious it is.

In the particular case of St. Louis County, state legislation is provided enabling the various municipalities to be given the necessary authority for them to enter into agreements with the county to dispose of the refuse through county operated facilities. This problem is licked, but then the next thing that happened, there was a bond issue which was immediately defeated because there was no groundwork laid for educating the public for the bond issue which was eventually coming. This bond issue was finally passed two years later, after a sufficient program was conducted in public relations, and so I think that this should be the prime attention. No matter how this problem is solved, this particular one, whether by landfill, composting, or incineration, I am sure it will be solved, but no solution will be arrived at if there is not a proper program of public education.

This should be begun immediately with a real plan, not done haphazardly, and this may require funding, too. It may have to be done through radio, through schools, various media and so forth, maybe some sort of an organization set up to do it, and then I don't think we should forget organizations that we have.

We have the Kiwanis, the Lions, the Rotary, and a number of other organizations. We have the Shoppers of America and the American Public Works Association. We have a number of engineering organizations. We have all sorts of organizations that don't cost anything. It is a matter of organization to get the job done.

MR. ROSENDAHL: There is one other thing I would like to talk about in this plan. I thought somebody would bring it out, and there are five or six gentlemen from Philadelphia to California who could have come out with it, that is the fact that nobody has made reference to collecting some of this data from the adjacent university through the various agencies and bodies that they have.

At our own State university, we have a program of community development, a great source of research. George Hanna has the Water Resources Board, and research in this area and so forth, and this all would have much bearing on the population and everything else, in tentative land use and the like. I don't know how much you are doing with this at Drexel Institute, but I am sure you collected a lot around Philadelphia and in the lower basin in the last ten years. I am sure that this is true in Cincinnati. There is much data available at the University of Cincinnati, facts that can give you information which you might have trouble getting otherwise, often from the political agencies, or through the resources of individual people. As usual, too, the United States Census Bureau has many facts about conditions and how they are changing.

Universities are a good source, a tremendous source, and should be utilized. Bring them into the picture more. This is the reason we have them here, many of their engineering department are here. We are conscious that behind this whole conference was the thought that we should show the need for specialization in the engineering schools. You consulting engineers know this is a big need. It is not something on incineration, a dump, or just the air pollution factor alone, but it is the whole picture, for the planner alone can make the overall use of the plan, but he still needs the technical knowledge of all trained people to assist him in this.

FROM THE FLOOR: I just wanted to say we have finally gotten to the place in Montgomery County (Ohio) where we are going to have a county-wide program that is finally going to be successful. For anybody who is starting to plan a program, I would like to say that there is one word that you must remember. It is called patience. When you start off on one of these, you have two years to go before you can get anybody to listen to you. Then you can, finally, if you are very fortunate, get a study made. Then you will be quite some time -- anywhere from three to five years -- before you will actually get a program begun and underway, and then there probably will be several years after that before you finally have a refuse disposal system in operation.

I realize this sounds very disheartening, but you just have to figure that patience is going to be required. Once you are started, you are going to be working with people who will not believe you at first. It will take a lot of education, and it takes a lot of time before you ever get to the place where you have solved the program. Patience is a very necessary part of this business.

MR. ROSENDAHL: About that time, somebody comes up with a question which has been asked of a previous panel. I think Paul Reid attempted to ask it. How long should a master plan be good for? A master plan is good only as long as it is in effect. If the conditions change, you have to revise it.

As Mr. Seiler just said, by the time you get them off the shelf, so to speak, or out of the drawer, you had better be ready with the revised projection.

FROM THE FLOOR: I would like to elaborate a little bit on what has already been said. I am with Montgomery County. We have been in the process -- I myself, although I am new, but the incinerator program or the waste disposal program in our area has been going on for approximately twelve years.

I don't want to discourage people who are here, but we found that our main obstruction to this is public opinion, the voters.

Everyone I talked to felt that we needed some sort of disposal, but as was mentioned before, they always wanted it in someone else's backyard.

We have approximately 580 square miles in our county, and a population of approximately 600,000 people, so we do have a problem. We finally got over the hurdle by going out and talking to people and selling the idea of what we are doing and how we are doing it, and I might say that we found out in the last couple of years by going to different civic groups, clubs, and so forth, you will find out that when you first start, you practically have to force your way in to talk to the people and present the program to them, but once you get started and you have people listening to you, then you find out it gets easier and easier to get into these clubs and organizations.

I wouldn't recommend anyone going out and telling us they don't need us today, they are going to have the garbage piled up in the backyard tomorrow. You have got to give them facts. You have got to be truthful about it. I think that this is one of the problems that we ran into in Montgomery County, school bond issues or something came up. People told us they didn't vote for this because they were told that if they didn't vote for this, the kids wouldn't go to school the next year, but when they voted it down the kids went to school just the same. You have a problem there, as was mentioned, of public relations. It means a whole lot. It takes a lot of legwork, a lot of extra time of persons to go out and sell it.

MR. ROSENDAHL: I thought we would get out of here earlier since we started a half hour earlier. Unless there is a question or something pertinent to the particular problem, I will take the next few minutes to make a summation.

In the program, I said there would be a quiz. I have the papers, gentlemen. Last night we decided that since you were all very honorable men, we would put you on your honor. You may take the papers home with you tonight, study them, and bring them back tomorrow morning. If you want to go to the library to get the answers, that is your own baby.

Anyway, I think we have pointed out in our discussion, even though we rambled a little bit, this was a preliminary plan, it was an approach to a study. It was not a plan, it was a study. Though the recommendations that came out on this at the time were not concrete, there was no pinpointing of what you should do, it said the first thing was that the county commissioners should immediately undertake a comprehensive study. This is the thing that this little plan indicated. There is an inherent problem here and it needs a concrete, definite, comprehensive study by all competent personnel before it can be solved.

At the time these data were gathered, they had limited material. Remember this was in 1962, and since that data was collected in 1960 and 1961, the picture of composting has come into being to the extent that it has today.

This, today, would be a recommendation that should be given consideration. Also, the other thing that isn't brought out here too well is that some consideration should be given to the industrial waste problem because the tonnage figures were given you here are for 1962 -- 1960 figures really -- and this is a growing factor. What are you going to do with this?

As was suggested here and the previous panel, are you going to set up an industrial refuse disposal site of some sort, and by some means are you going to look at this refuse and permit it to go into private landfill or dump areas? The nature of much of it is such that it doesn't decompose. Some of it has problems of chemical solution, chemical pollution of the ground.

This is particularly true in this particular area because of the nature of some of the industries which could present a problem, just as we have had in the Cincinnati area, and which I am pretty sure Dr. Hackett gave you quite a dissertation on what can happen.

You have many problems here, and one which I am sure didn't come out in the picture is the factor that we, in this state, are a planning agency involved with introducing and trying to bring industry here for the betterment of our communities. We are working with municipalities and the like along this line. This is a problem you have to face when you bring an industry in. Whether they are going to dump in the water of the area, and whether they are going to have enough water are problems which must be answered before they will decide to come into your community.

You can't neglect the industrial side of it. Let's face it. Industry is the bread and butter of the community. There is where you find your jobs. This is where you keep the unemployment rate down. This is where you keep the welfare rates down. This is a vicious cycle.

The other thing is that in this case, I mentioned the fact that they have a 701 program, the planner should be coming up with a comprehensive study. From this is needed a detailed engineering study of all the feasible factors that come into it, transportation, roadway routes, construction costs, merits of one against the other. These are all a part of the long-range plan, as well as bonding, financing, and everything else that comes into the picture.

This brings in the city engineer, the county engineer, county sanitary engineer, and all the public officials that are involved in this and that are dealing with this everyday fact.

Another thing, as I did mention in the problem, the sewage plants are overloaded and this is also a factor, again bringing out, as has been stated here in previous studies and as was brought out again today, the question of whether it would be feasible to locate incinerators in the area. Would it be feasible to locate in areas where the sludge can be a supplement to what you are dumping? Look at the industrial side again. It takes research. It will take some chemical research and your university will come into the picture again. This is a good source, a prime source for some research facilities.

These are the prime factors, I think in very simple form. It is not a job for just any one of us in any one of these professions and skills that are represented in this room, but it is a joint operation and it must be faced jointly together. Although it is a progressive thing, the indication here is that a plan which you thought was incomplete and which is incomplete, lacks a lot of data, lacks a lot of financial factors and what their possibility is, and you coming in from outside the state, not knowing the State of Ohio, not familiar with the area, it presents problems to you that were question marks in your mind, because the problem wasn't complete enough.

Therefore, it is a problem that has to be solved and it means digging in deeper, means a problem that you have to sell the public officials. But the biggest thing is that you have to sell the citizenry on it as you go along and do a public information job that needs to be done in this area, not hid under a bushel basket that we are making the study of now and not talking about it, not something to work on for two years and then have it come out when you have a bond issue on it along with a school bond issue, for five million dollars for the incinerator.

Everybody says, "I don't want it there because it will ruin my property," because the education job wasn't done.

Gentlemen, I think that this session should have awakened in your mind some questions. It was strictly informal, but I hope it makes you think when you go home Friday, that you have some of the things that you need to know. When you speak to your groups, whether it is in your own area or as a consultant, or whether you speak to the local engineering society or to the American Public Works or anybody else, your planners' association, your planning groups, or your own planning board, that you bring these facts before the city officials as well as others and start getting these things across.

Don't forget, your public health people must be in there too, your state health board, state health department and your local health department. They are vitally concerned with it. Too often from the purely psychological side, the people think that in the state of Ohio -- as I mentioned earlier -- our local health departments have the problem of enforcing the operation of these dumps and passing the ordinances. Any time the place smells, they get bugged on the telephone, and then they go out and issue an order and that is it. They have a turn-about the next day, the operator does it for two or three days and everything is all right, and the commissioners or the city officials or whoever it might be are prone to look the other way.

I guess this is a digression, but two years ago one of the counties in the northern part of the state had a new health commissioner come in. I was spending a few days with him, talking to the sanitarian. I had nothing else to do in this small college town in the summertime, so I took a ride around. I went outside the confines of the city, the corporate limits. There was a dump with four pumpers out there fighting the dump fire, and the smell was all over. The wind had changed and it was coming right out of the north, not where they said it should come from.

Next morning, I asked him, "What ordinances do you have in your area to prevent this dumping?"

He said, "Well, we have an ordinance against open dumping, and there is to be no burning."

Immediately one of the chaps said, "We can't do anything about that. It belongs to the city."

It was located out in the township, but it belonged to the city. It was up to the county health commissioner to get them in and stop the city from doing this.

This is now going on. There had been attempts to get co-operation between various factors, but not much progress had been made. We talked to one of the county commissioners and he wasn't even aware of it.

About that time, the prosecutor was called in and started the ball rolling a little bit.

At least there they are conscious of the fact and there is an answer to it. This takes a little effort on the part of everybody to do the job.

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